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AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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New Types of Cranes.

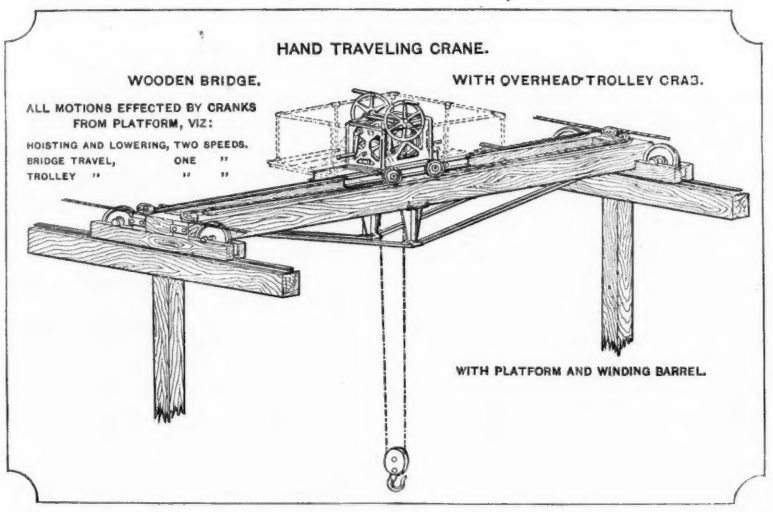
We illustrate herewith four new types of cranes, built by the Yale & Towne Manufacturing Company, Stamford, Conn.

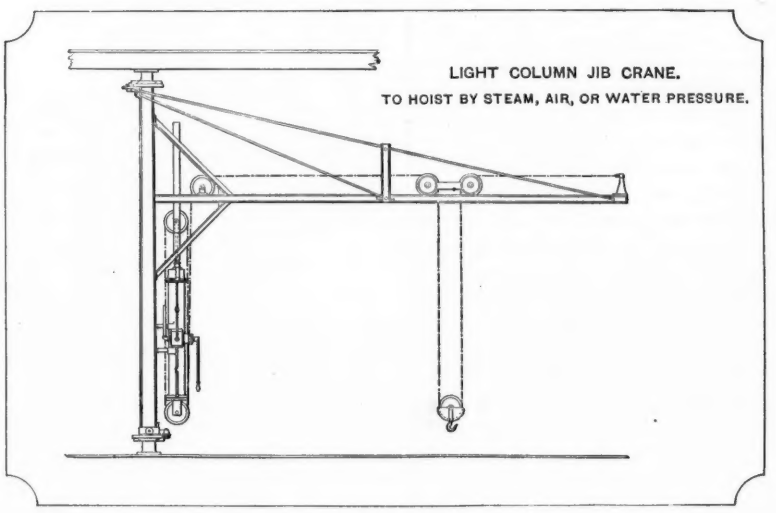
The hand traveling crane is adapted for outside use, such as yards of foundries and shops, stone yards, railway stations, etc. As illustrated, the bridge is made of wood, although it may, of course, be made of iron if preferred.

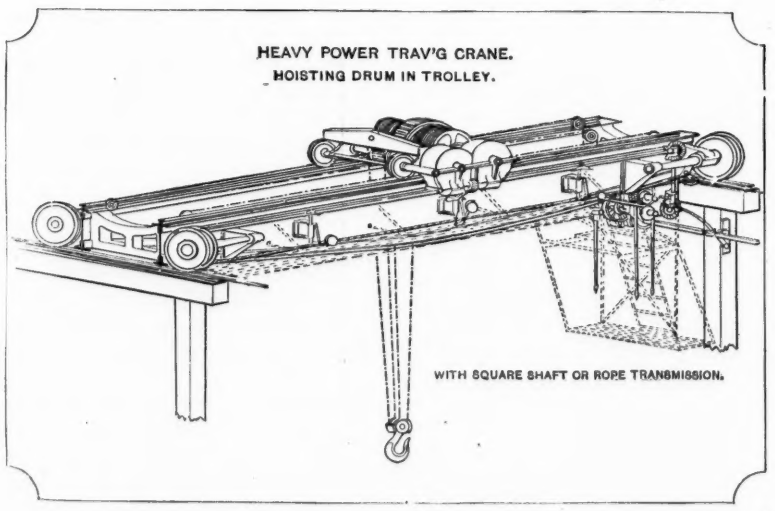
A notable feature in connection with the course, very slow speed, although in case where it is merely desired to raise a block of stone or other article far enough from the ground to move it about, it is no objection, and the traveling motions are so easily accomplished that they can be made at a fair speed, even by one man. The cranes can be made of any capacity and any span.

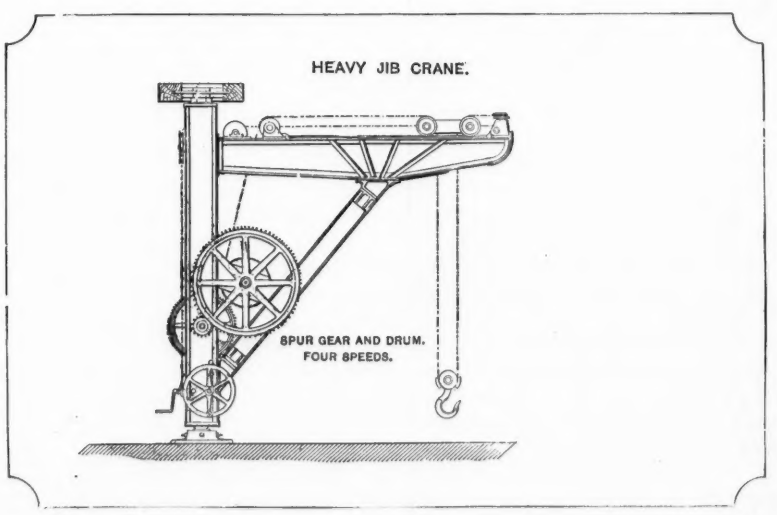
The direct-acting crane is designed to act by direct pressure either of steam, air, water or natural gas. Its particular point of difference from other direct-acting cranes is in the accounts, for long shops the experience of English engineers, and the experience thus far gained in this country, seems to indicate that it is preferable to drive cranes by fast running ropes, preferably a cotton rope. Power, being communicated to the prime mover in the crab either by a square shaft or a fast-running rope, is taken off by means of proper clutches and reversing gear, so as to revolve grip-wheels at the end of the bridge, which engage with fixed cables for propelling the bridge on its longitudinal tracks and for moving the trolley across the bridge. The longitudinal fixed cables are on the system of Mr. T. A. Weston, which insures parallelism of the trucks with their tracks, and also insures smooth and steady motions of the bridge.

The hoisting mechanism of the crane is contained in the trolley, which travels across the bridge. Power is communicated to this mechanism by means of a square shaft, which runs across the bridge. This shaft carries a moving pinion, which gears into a pinion fixed to a worm shaft: This worm shaft drives a pair of worm wheels, one of which wheels is attached to a pinion shaft, and the other is used simply to take the thrust off the collar. The shaft, thus driven by one worm, gears directly into a gear wheel on the hoisting drum. This drum is a double spirally-grooved drum; that is, it winds the chain from both outer ends inward. The result of this is that the hook is always exactly central, and moves in an exact vertical line, and the load is always equally distributed on the two girders. This is a particularly desirable feature, as it provides against straining the girders and also in foundry work, and in other positions where a direct vertical lift is essential. The design of the crane is such that the hook will pass up between the girders, thus giving the greatest possible amount of clear hoist, and at the same time the trolley can pass directly over the mechanism at the end of the bridge, and the crane thus


HAND TRAVELING CRANE.
WOODEN BRIDGE.
WITH OVERHEAD TROLLEY CRAB.
ALL MOTIONS EFFECTED BY CRANKS FROM PLATFORM, VIZ:
HOISTING AND LOWERING, TWO SPEEDS.
BRIDGE TRAVEL, ONE "
TROLLEY " " "
WITH PLATFORM AND WINDING BARREL.







NEW TYPES OF CRANES.

carriages or trucks at the end of the bridge is the fact that the cross-beams of the trucks are very close to the longitudinal stringers of the tracks, so that in case of any breakage the crane will have but a very short distance to drop, and will not cause undue strains. The crane is propelled on the longitudinal tracks, and the trolley is traveled across the bridge by means of Weston's fixed cables, which pass over grip wheels in the trolley crab. This crab contains the hoisting mechanism, so that the operator, standing on a platform which surrounds it, can, by means of the proper cranks, hoist the load, and either travel the trolley on the bridge or the bridge on the longitudinal tracks. The hoisting mechanism is provided with changes of speed for light and heavy loads, and several of them which have been built for stone yards, have been geared so that one man could raise five tons. This necessitates, of method by which a greater hoist is obtained than the motion of the piston. This is accomplished by using four parts of chain, which pass over the sheaves on the piston head, while only two parts pass around the hoisting block. When the piston head rises upwards, therefore, the block moves two feet for every one foot of the piston head. The crane is also provided with hand mechanism for moving the trolley, which is not shown in the illustration.

The power traveling crane is driven by a longitudinal square shaft, which turns in tumbling bearings. The illustration is too small to show these bearings properly, but they possess the desirable feature of moving in vertical lines, so that the bearing itself can be any length, and can encircle the shaft as much as may be deemed desirable. While for short shops—that is, not exceeding 200 feet in length—the square shaft is desirable on many

gives a great amount of trolley travel.

All parts of the crane are in full view and readily accessible, and they are all simple and heavy.

The cranes are designed for rapid work, some of them being now under construction which will have a travel of 125′′ per minute on the tracks.

The nominal capacity of the heavy jib crane is thirty tons, although considerably heavier loads have been lifted with it, without apparent injury. By a simple arrangement, the operator can use any one of four speeds, the ratio of the lowest speed being 366 to one; of the second, 163 to one; of the third, 72 to one, and of the fourth, 32 to one.

The trolley is traveled on the bridge by means of the crank shown at the rear of the mast. The main hoisting chain passes around an equalizer at the end of the jib, so that the strain is on two parts of the chain, and is always equal.

The Standard Twist Drill Grinding Machine.

This machine is adapted to grind drills of all sizes, from $\frac{1}{8}$ inch to $1\frac{1}{4}$ inch diameter. Both sides of the drill are ground without removing from the chuck and exactly alike; more or less clearance as desired can be given, but the angle at the point remains 59°. The emery wheels are specially made, and run with water; size of wheel 9 inches diameter and 2 inch face.

It is claimed for this machine that it is extremely simple in construction, having no delicate parts to get out of order, and requiring no adjustments that cannot be made by anyone. All wearing parts are of hardened steel, and all parts interchangeable.

Manufactured by the Standard Tool Company, Cleveland, Ohio.

Foundry Notes.

BY F. B. SHAFFER.

There are some odd ways of doing odd jobs, and the jobbing foundry (especially the country shop) is the place to find those odd jobs. It is there that castings are made under great difficulties, and it is there that the moulder has a chance to get his eye-teeth cut. Broken castings of all sizes and shapes, covered with grease and dust, are brought to the foundry (on cast day) to have new ones made just like them. The casting was originally made over a pattern that was in three or four parts, and it is right here that the finer abilities of the moulder are displayed. Pieces of sheet-iron, pasteboard or sand-paper are cut into odd sizes and shapes, and placed in pockets and recesses, then drawn out, and, after the pattern is removed, replaced in their proper places; this all requires time, care and skill.

I have often seen moulders, after having cast a piece of this kind, turn it over, examine it, and look with pride on a job that was looked on at first as a regular sticker.

I was employed by a firm in the northwestern part of this State, and had, until quite recently, charge of their foundry. In that shop those odd jobs were common. The first year I worked there an order was sent to the foundry for a $10'' \times 10''$ pulley. The pattern consisted of two $5''$ rings and a solid web. By some means or other the foreman had forgotten that there were two parts of the pattern, or else had mislaid one of the rings. At any rate, it fell to my lot to make the pulley, and to make this pulley was to me a puzzler. The pulley had been made before, the other half of the pattern could not be found; so I started on the job determined to make that pulley.

Fig. 1 represents the half of the pattern (that is, one $5''$ ring), rammed up in the cope; the dotted lines show the height it is to be raised. Fig. 2 represents the web, which is solid, excepting a $\frac{7}{8}$ hole in the center for the hub.

The manner in which I proceeded was as follows: I placed the cope of the flask on the follow-board rim down, placed my pattern in and rammed it up, secured by gaggers, as seen in the cut.

I set my gate on the hub, as is seen, and then turned the cope over and made my parting, and then placed the drag and began to draw the pattern $1''$ at a time, carefully packing the sand around it. I continued to draw, as indicated by the dotted lines, until I had reached the desired height. I then filled the drag with sand, and packed it solid, and, when full, I lifted the drag off, with the rim in the drag. I then set the drag where I wanted it, drew the rim out, dressed the mould, set the core in the drag side, and closed the mould by placing the cope on, as this was the part I had secured by gaggers, as is seen. I made three pulleys this way before the other half of the pattern was found.

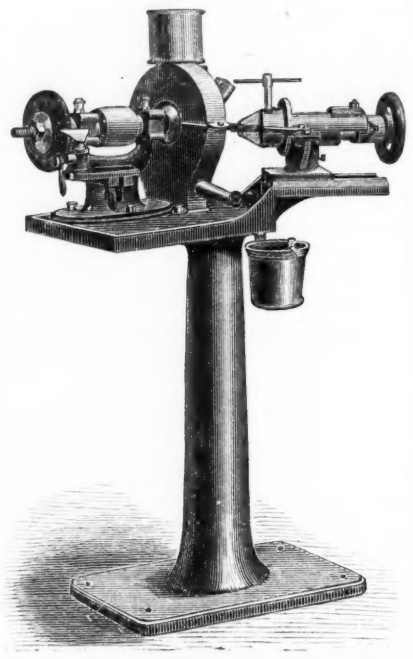
A steamer recently arrived at New York from Newcastle, which is specially constructed for carrying oil in bulk. The engines and boilers are well aft, and her hold is divided into several apartments, reached through man holes in the deck. The vessel will carry 17,000 barrels of oil.

Patent Law Reform.

BY JOHN T. HAWKINS.

I have read with a great deal of interest the very excellent article on the "Need of Patent Law Reform," by Mr. Henry D. Morris, in your issue of July 31st. Among the mass of matter that has been written on this subject within the last few years (axe grinding in the interest of patent-attorneys being the real object of many of them), I regard this as by all odds the fairest and most sensible that I have seen.

The difficulty propounded by Mr. Morris as inhering in the vast accumulation of patent



TWIST DRILL GRINDER.

records and the rapidly increasing labor required to effectually make proper searches for novelty is, however, greatly exaggerated. There are also several other minor points in which I think he is under a misapprehension or to some extent loses sight of. That it is now a work of great magnitude to properly pronounce upon the novelty of a large and rapidly increasing number of patent applications daily entered at the Patent Office is undeniable, and it is equally palpable that it must under the present system increase at a rapid rate; but the novelty of an invention must be determined by some authority, and probably we can never by any means avoid the courts of law as a last resort. It would, however, be infinitely more objectionable than the present system to impose upon the courts the onus of this work, as is done in Great Britain and other countries. Under that system, no inventor has any security whatever, unless the proper court of law shall have passed upon the novelty of his invention.

I have read, with equal interest, a communication to the *Iron Age*, of July the 15th, over the signature "Counsellor," from which I quote below as meeting the aspect of the case very completely:

"That there are abuses and defects in the law, its administration, and practical workings even in America cannot be denied. But, nevertheless, our system is justly regarded as the most highly developed and perfected system of all those in operation. Its distinguishing feature is the preliminary examination to which every invention is subjected before the letters are issued. The amount of labor and the degree of knowledge and skill which this requires is undoubtedly great, but the advantages derived from it are readily apparent. In England and other European countries letters are granted almost as a matter of course. There may be 20 or 100 patents covering the same ground, and no one can say to whom the patent rightfully belongs until the question has been litigated between all these various patents. The same difficulty exists here to some extent, but after the examination has been made there is at least a *prima facie* right to the patent on the part of the inventor to whom the letters are granted. The difference between the English and the American systems in this respect is immeasurable. A great many applications are entirely rejected, and others are rejected in part, so as to require modification by amendment. In fact, the Patent Office is becoming more and more strict every year. Very few applications go through the first time without either a rejection or a reference. The claims almost always require some change in order that there shall be no conflicting patents even in detail. The office in this way accomplishes much of what in England is thrown upon the courts. Admirable as this system is, it still has some defects. The salaries paid some of the examiners are not sufficient to secure the services of really eminent experts in the various branches. The position of examiner is regarded even by themselves merely as a training school for patent solicitors, patent lawyers, etc., and the office is thus deprived of the services of invaluable men just at the time when they are becoming indispensable. The surplus revenue, which increases in amount every year, could not be employed in a better way. The examiners are often called upon to decide the most difficult questions of law and fact. They should therefore be both trained lawyers and experts."

So far as the difficulty and great amount of labor in making the searches is concerned, it appears that, if patents are to be granted at all, it is the first prerequisite that their novelty must be decided upon. This being granted, there simply remains that this should be done in the cheapest, most expeditious and thorough manner, and by means of the most systematic organization possible. This kind of work in competent hands may be so thoroughly systematized as to permit of immense amounts of it being done by what might appear to many to be comparatively few men. Inventors should be, and are I believe, entirely willing to pay to have this done; and that the fees should be such as to give adequate, not to say liberal, pay to the necessary number of qualified examiners, no matter how large this number may become must be admitted, unless the value of the patent system to the country is considered to be sufficiently great to warrant appropriations in money for its support. This is a great country, and its greatness is so largely due to its inventors that it is to be expected that the quality should be high, and number great, of men who are employed for this purpose. What matters it if there should in the next fifty years be required ten or twenty times the force now necessary? They can and would be I think willingly paid for by inventors; and, when the city of Washington becomes too small to hold them, accommodate them somewhere else. The trouble is that our national legislators do not appreciate the magnitude of the real interest at stake in this patent question as affecting the well-being of the country; hence they withhold, by their parsimony and neglect, a large amount of the moneys now paid in by inventors, instead of providing all the force, and the proper quality, too, perhaps, required to do the work.

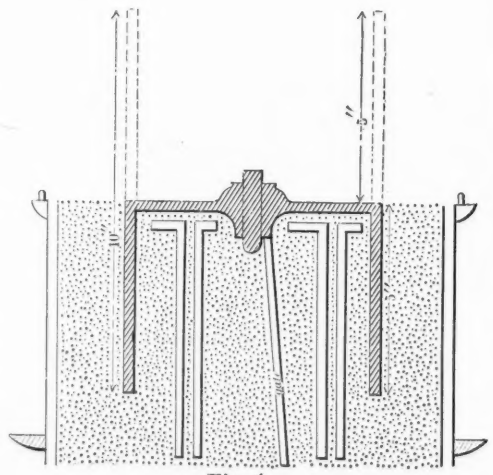


Fig. 1

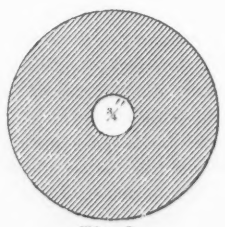


Fig. 2

MAKING A PULLEY.

"Counsellor" says: "One suggestion is urged looking toward the reform of the system, and that is the establishment of a higher standard of invention in order to merit a patent." Doubtless it would inure to the benefit of the whole system if some means could be provided for cutting off a large part of the really insignificant inventions. But who shall decide the value of an invention at the time a patent is applied for? In a vast number of cases what at first appears to be so trifling a matter as to nearly amount to absurdity to suggest allowing a patent for it has proved not only highly renumerative to the inventor or possessor, or both, but of very great value to the community at large. So that it might work the grossest injustice and wrong to delegate to any man or set of men the power to say whether or not an invention was of sufficient significance to warrant the allowance of a patent for it or in any way to secure it to its inventor for a series of years. Perhaps the only way of avoiding this difficulty is by placing the natural increase of expenses which must attend the examining process upon inventors themselves in the way of increase of fees. This would make a self-cure of that part of the evil—if indeed it be an evil—and prevent the patent system ever becoming an "unwieldy mass" which "may fall to pieces of its own weight."

Discarding inventions for which application had been made because of adjudged insignificance would not reduce one iota the labor of examination for novelty, because all such matter would become of record, and have to be searched, as now, to enable the novelty of any subsequent application in its particular class to be acted upon. The mere making public of a device or conception in any way is now sufficient to invalidate its novelty at the Patent Office, whether application for patent has been made or not for it, and this is as it should be. In this way, if an inventor has some supposed insignificant application set aside for want of importance, no subsequent inventor can be entitled to its exclusive use nor be protected by the Patent Office for a similar thing. Hence all such records must be searched; but those which would be cut off by the fear of, or inability to pay, the fees would not become of record, and to this extent the flood of applications would be stayed. There would be in time, even in this, a good deal of injustice to the impecunious inventor, particularly as in many such cases the most important inventions originate with this class of men, and there would be attempts made to prove priority of invention by non-applicants against subsequent applications, but it would be the only practicable, and the most equitable, way that a reduction in the present or prospective flood of applications could be brought about and the labor of examination reduced. The adoption of periodical fees, as in vogue in other countries, would give no relief, because this would only cut out worthless patents after they were granted, and would rarely deter inventors from investing the preliminary fees, trusting to their future success to keep the patent alive. All such would be subject to constant examination as part of the record.

Mr. Morris says: "The patentee may lock up his invention, however valuable to the people, who are thus utterly deprived of its use for many years. Nothing is more common than the custom of obtaining patents, not with any intention of putting them to practical use, but merely to prevent others from so doing."

While there are doubtless a good many cases just such as described, and which are unavoidable under the present system, I think it is much less often done than is conveyed in Mr. Morris's words. What is probably mistaken in most cases for a determination to merely patent an invention for the sake of holding it against others, without any intention of using it, is only the rightful desire of an inventor to secure to himself an invention pending his ability to prosecute it in order to avoid the risk of having it stolen from him. A great many

inventors are so situated that they are in constant danger of having their ideas appropriated surreptitiously by competitors in business, or subordinates in their employ, while the condition of their affairs may not warrant them to bring to as early fruition as they might desire what they have really invented; and in such cases it is the merest justice to them that they should have the opportunity to protect themselves until they can prosecute their inventions or put them into practice. This view will have the more force when it is remembered that, if they did not have the opportunity to protect themselves, they would keep their ideas within themselves, or, perhaps having no security, lose the incentive to invent in a large degree. If they do not invent, the country is not benefited at all; and if they do, they should be protected, and the public should expect to await their convenience. If they invent and procure their patents, the maximum period that the public can be called upon to attend their pleasure is fixed after the patents are granted. If they lock it up in their own breast or head, the country must be satisfied to await their convenience, however long that may be.

I believe that the solution of about all the real difficulties attending the present admirable American patent system lies, if it must be self-sustaining, in applying all the money inventors now pay to sustain the Patent Office; and to increase its efficiency, increase fees, if necessary, at this time, to insure full and sound examination, and such further increase of them in the future as will suffice to keep this system up to the highest possible state of efficiency, even if it does rule out the most insignificant inventions and work some little unavoidable injustice to this class of inventors. If it should become necessary to curtail the number of patents, it would generally be those which the country can best do without, although in some instances it might lose a very valuable conception or invention.

The above recommendations are, of course, made on the assumption that the Patent Office should be self-sustaining; but it is by no means admitted that this is necessary. I believe that this country could in no other way so greatly add to its general prosperity as by applying a part of its revenue to the sustenance and maintenance of the present patent system, so as to provide for many years in the future for full protection for the most insignificant inventions that may be made, providing ample force of expert men to conduct it, no matter how extensive it may become in the future. There is, in my opinion, no object for which the general public could be taxed that would be productive of so much general good as this; and as the country grows in importance and power and wealth (the latter more largely created by inventors than any other class), a regularly increasing appropriation by Congress for the support of the Patent Office—after, of course, applying all the funds derived from inventors themselves—would be the most economical investment of public money possible to make.

Angus Sinclair, editor of the *National Car and Locomotive Builder*, writing to his paper of the railway machinery exhibition at Liverpool, brings out the English characteristics strongly. He writes:

The authorities in charge of the Liverpool Exhibition do not give the representatives of foreign papers any facilities for obtaining information about the exhibits. They have to take all their notes outside the railings, and few of the parties in charge of exhibits are able to give any particulars about the details. The man in charge of Sharp, Stewart & Co.'s locomotive was dreadfully shocked because we climbed over the railing and went up on the foot plate. We wanted to go inside the fire-box, but he firmly refused to permit any such freedom, and it was by the exercise of persistence, which was subsequently denominated Yankee cheek, that we got the fire-box door opened to get a peep in. No persuasion could induce the man to open the smoke-box door. Under these circumstances we did not feel inclined to force information from them.

Mr. Sinclair's experience at American exhibitions, where his going "inside the fire-box" would have been looked upon with special favor, has evidently unfitted him for appreciating a pure English exhibition where the main object, viewed from a Yankee standpoint, seems to be how best not to show things.

In telling how to produce a duplicate from a broken casting without the original pattern, the *Electrical Review* says: "Put the pieces of the broken casting together and mould them, and cast from this mould. When the casting is drawn from the sand, place it in a charcoal fire and anneal it. It will expand to the original size of the pattern, and then remain in that expanded state."

[The above is correct so far as it goes, but in practice the casting will require heating seven or eight times before it becomes as large as the original. After heating and cooling in the open air the above number of times, the casting will not become larger by successive heatings.]

Railroad Shop Notes.

The Staten Island Railway, from St. George to Tottenville, 12 miles, has ferryboat connection at either end of the road with Perth Amboy, N. J., and New York city.

The repair shops at Tottenville keep in repair 12 locomotives, about 75 passenger cars, beside many freight, platform and coal cars. The rolling stock of the Staten Island Rapid Transit Company is included in the above, and the shops also do repairs for the ferry-boats at either end of the route, and also for the steamboats running from New York to Bay Ridge, L. I., these steamers also being controlled by the Rapid Transit Company. Twelve men are employed in the Tottenville shop, and do all the repairs necessary to keep the rolling stock in first-rate condition.

Thos. Tyrell, master mechanic, is making a new ash-pan for engine No. 5. This pan is not self-dumping, but has three places for cleaning—one on either side, and one at rear end of the pan. These pans do not freeze up in winter, like the old pans, in which a mess of ashes would accumulate, and often cause the grate bars to burn out. The pans have given satisfaction under three of this company's locomotives, and will be fitted to all as soon as practicable.

Some of the locomotives are fitted with the extended smoke-box, and some still use the old-style front and smoke-stack. We rode twice the length of the road in a car drawn by Cooke locomotives. The first trip was noticeable by the amount of soft coal, smoke, cinders and gas which also took passage in the cars, while on the second trip everything was clean and free from smoke and fragments of coal.

The engine making the second trip was fitted with the extended smoke-box and straight stack, while the engine drawing the first train was without the extended smoke-box.

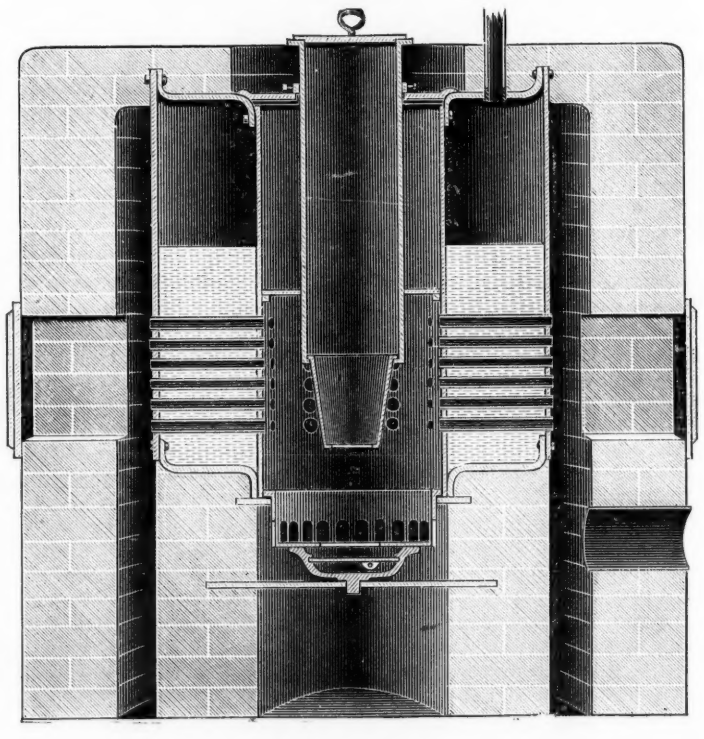
Mr. Tyrell uses the brick arch in each fire-box to serve as a "baffle plate" in protecting the tube ends. Cast-steel flanged bushings, we are informed, had been placed in each tube end for the above purpose, but they soon burned out, although they lasted longer than iron bushings under the same conditions.

As in all small shops, many jobs have to be "rigged up for," and we noticed a neat little dodge to make a big lathe do duty as a small one.

Adjustable chuck jaws were bolted to the big face-plate, and served to hold car wheels when so desired. An independent chuck about 12″ in diameter was fitted on end of the lathe center. It was blocked out from the face-plate by two parallel pieces, and held in place by two bolts put through both chuck and face-plate.

This shop is about being removed to Clifton, where it will temporarily occupy the old ferry landing. It will be necessary to increase the capacity of the shop, and more tools and machinists will be necessary to meet future demands. The Rapid Transit trains now run only to Clifton, on the east side of Staten Island, but the route, we understand, has been surveyed further; and will doubtless soon be built.

It is also rumored that a double track is to be built from Tottenville to Clifton to accommodate the increased traffic of the road, and doubtless the "Rapid Transit Road" will eventually become a belt line encircling the whole island.



BOILER FOR STEAM HEATING.

Boiler for Steam Heating.

The boiler consists of two heads connected by an outer shell of boiler plate and an inner shell or flue of the same material, keeping the heads about three feet apart. The tubes run from the inner to the outer shell, and are placed in four groups to facilitate the placing of doors for cleaning. This completes the boiler proper which is tested to 160 or more pounds per square inch for safety, though the greatest pressure used need not exceed ten pounds.

The design of the inside fire fittings are taken from an ordinary self-feeding house coal stove, and they are arranged in the central flue as shown. These can all be removed from the top for repairs or renewal, being simply laid in place.

The height of the feeder from the grate can be varied to suit the body of fire required, or the quality of fuel, by adjusting the set ring on top of furnace, it being understood that the average correct height is maintained when the top of coal magazine is level with the top of brick work, as shown in the cut. The vacant space above this ring is kept filled with some material to prevent the escape of heat.

Surrounding the coal magazine and immediately above the top row of fire tubes is a heavy cast iron deal plate, which prevents the excessive heat of the coal from injuring the heating surfaces above the water line. In the engraving this plate is shown higher than it need be; in fact it may rest on the projecting ends of the tubes. Generally the grate casting is kept higher than shown, so no heat will strike above or below the water in boiler.

It is not necessary to now describe at length the outside settings of furnace. A lever shaker arranged to be operated without raising dust, and a self-regulating damper adjustable to suit temperature are supplied. Also water and steam gauges, etc., a steam gauge being placed in the kitchen. or where it is most likely to be seen by attendant to note when the fire is getting low and requires shaking.

It is claimed for this boiler that it is of simple construction, and that every tube is a stay to both the inner and outer shell, while as many more additional stays may be added as desired. There is no crown sheet above the fire to be endangered by low water or to burn out and leak; there are no concave surfaces to collect sediment above the fire while there is ample room for sediment to collect below the tubes where there is no heating surface to cake it, and where it can be occasionally blown out. The tubes are completely covered with water, and can be made of the best length in proportion to their diameter for the purpose required. The draft being slow, short tubes are the most effective. The tubes are easily accessible for cleaning from the outside, and should they become scaled within they can be scraped without removal through hand holes. The boiler has a large water and steam space, the latter unincumbered by tubing, giving a large water surface and storage capacity for heat given out by fire, when not all being used in the coils. The body of heat being centered in the boiler and the side distance between the tubes increasing towards the circumference causes the circulation of the water to be complete.

The outer heating space utilizes the exhaust heat from the tubes for a warm jacket round the outside of boiler, the coldest air in this chamber falling at its outside and passing out at the aperture provided to flue at a temperature lower than the heat of the steam. There are openings provided by which the state of the fire can be noted both above and below the grate.

The manufacturers are Robert W. King & Co., Georgetown, Ont., Canada.

Annealing Steel Wire.

In a paper read before the British Iron and Steel Institute, by Dr. Percy, president, he describes the method used by Col. Maitland in annealing steel wire of high tenacity. He says:

The wire was in three pieces, each from 3″ to 3½″ long, which together weighed about eight grammes. They were packed round with asbestos (to check chilling), and pushed into a combustion tube about 8″ long. At each end of the tube a plug of copper gauze, about 1½″ long, was inserted, the pieces of steel wire and asbestos lying between those two plugs. One end of the tube was sealed, and the other drawn out fine. The tube having been thus arranged, and placed in a gas combustion furnace, the plugs of copper gauze were first heated to redness with a view of absorbing the oxygen in the tube; afterwards the pieces of wire and asbestos were heated to very full redness, and kept at that temperature for half an hour. The gas was gradually lowered and then extinguished, after which the top of the furnace (the bottom and sides of which were of clay) was covered with a tin-plate screen and left until the following day, when the wires were withdrawn; they were slightly dulled on the outside, but quite superficially.

We are constrained to again make the request that all correspondents will give their full post-office address. We are in frequent receipt of questions which are not suitable for publication in Questions and Answers, and to which we cannot reply by mail from lack of complete address.

Modern Locomotive Construction.

BY J. G. A. MEYER.

TWENTY-FOURTH PAPER.

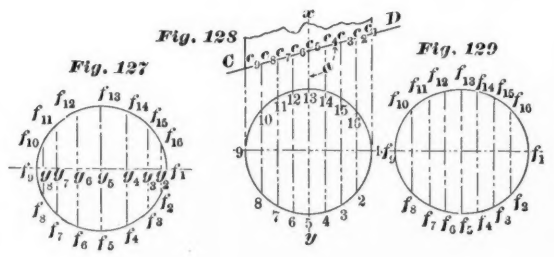
HOW TO LAY OUT THE HOLE IN THE SLOPING PART OF THE TANK, SO THAT IT WILL FIT THE CYLINDRICAL SURFACE OF THE MANHOLE SHEET.

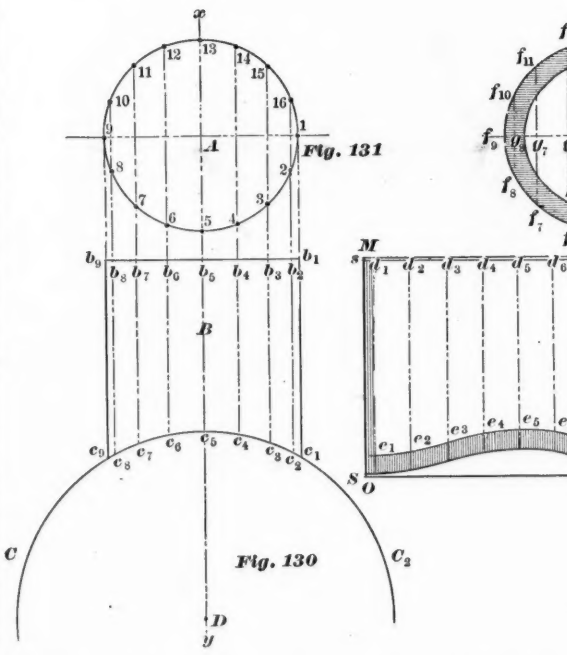
The shape of the hole in the straight surface $C\ D$ will not be a circle; it will have an oval form—in fact, it will be an ellipse. Its long diameter will be equal to the distance between the points c_1 and c_9, Fig. 123, and its short diameter will be equal to the diameter of the circle, Fig. 124. To lay out this hole we proceed in the following manner: Through the points 2, 3, 4, etc., Fig. 124, draw straight lines parallel to $x\ y$, and since we have divided the circumference into an equal number of parts, and each quarter of the circumference containing exactly one-quarter of the number of these parts, it follows that lines drawn through the points 2, 3, 4, etc., parallel to $x\ y$, will also pass through the points 16, 15, 14, etc.; hence, we may say, join the points 2 and 16, 3 and 15, 4 and 14, etc., by straight lines. Draw a horizontal line, as $f_1\ f_9$, Fig. 127; on this line lay off the points $f_1\ g_2\ g_3$, etc. The distance between the points f_1 and g_2 must be equal to that between the points c_1 and c_2, Fig. 123, measured on the line $C\ D$; the distance between the points g_2 and g_3 must be equal to that between the points c_2 and c_2, and from g_3 to g_4 equal to that from $c_3 c_4$ and so on. Through the points $g_2\ g_3$, etc., draw straight lines perpendicular to the line $f_1\ f_9$. On these lines lay off the points $f_2\ f_3\ f_4$, etc. The distance from the point g_2 to f_2 must be equal to half the distance between the points 2 and 16, Fig. 124; so also the distance between the points g_2 and f_{16} must be equal to half that between the points 2 and 16. Again, lay off the points f_3 and f_{15} the distance between g_3 and f_3, and also that between the points g_3 and f_{15} must each be equal to half the distance between the points 3 and 15, Fig. 124, and in a similar manner the points $f_4\ f_{14}\ f_5$ and f_{13}, etc., are found. Or we may say, make the length of the line $f_2\ f_{16}$ equal to the line drawn between the points 2 and 16, in Fig. 124, $f_3\ f_{15}$ equal to that between the points 3 and 15, and so on, but we must always remember that the center of each of these lines, that is the lines $f_2 f_{16}\ f_3\ f_{15}$, etc., must lie in the line $f_1\ f_9$, because the centers of the lines drawn between 2 and 15, 3 and 15, etc., are located in a line drawn through the points 1 and 9, Fig. 124. Here again notice that in this construction auxiliary lines are used, for instance the line $f_2\ f_{16}$ is an auxiliary line, and represents the auxiliary line drawn for 2 to 16, Fig. 124, and since these two lines represent one and the same line, it follows that these two lines must be of equal length as we have made them; so also the line $f_3\ f_{15}$ must be equal in length to that drawn from the point 3 to 15, and the same remark applies to the other lines. Through the points $f_1\ f_2\ f_3$, etc., draw a curved line, and cut out the sheet to this line. For simply laying out the hole in the sloping sheet of the tank, it is not necessary to divide the circumference of the circle into equal parts as shown in Fig. 124, and the view with all the auxiliary lines $b_1\ c_1$ $b_2\ c_2$, etc., Fig. 123, is not needed; all that is really necessary for laying out the hole is the circumference of a circle to show the plan of the manhole and the inclination of the line $C\ D$. Consequently, when only the plan of the manhole, and the inclination of the line $C\ D$ is given, as shown in Fig. 128, we proceed in the following manner: draw the vertical line $x\ y$, Fig. 128, from any point as A in the line $x\ y$ as a center describe the circle 1, 5, 9, 13, draw the diameter 1 to 9 perpendicular to $x\ y$, also draw the line $C\ D$, which must represent the correct slope of tank, hence this line will not be perpendicular to the line $x\ y$, but $C\ D$ must have such an inclination to $x\ y$ so that the angle at a will be equal to the angle formed by the end sheet of tank and the sloping sheet as shown at b, Fig. 120, through the points 1 and 9 draw the straight lines $1c_1$ and $9c_9$ parallel to $x\ y$, then the distance between the points c_1 and c_9 will be the long diameter, and that between 1 and 9 will be the short diameter of the ellipse which is the shape of the hole in the sloping sheet of tank. Divide the line $c_1\ c_9$ into any number of equal parts, say eight, and through the points of division draw the straight lines parallel to $x\ y$ and intersecting the circumference in the points 2 and 16, 3 and 15, etc. Draw the horizontal line $f_1\ f_9$, Fig. 129, whose length must be equal to that drawn between the points c_1 and c_9, divide the line $f_1\ f_9$ into eight equal parts to correspond with the number of equal parts in $c_1\ c_9$, through the points of division draw straight lines $f_2\ f_{16}, f_3\ f_{15}$, etc., perpendicular to $f_1\ f_9$, and make the length of each of these lines equal to the length of one of the corresponding lines drawn between the points 2 and 16, 3 and 15, etc., through the points $f_2\ f_3$, etc., draw a curved line, which will be exactly the same ellipse as shown in Fig. 127.

HOW TO LAY OUT A DOME SHEET WHEN THE DOME IS TO BE PLACED ON THE TOP OF OUTSIDE CROWN SHEET AS SHOWN IN FIGS. 130 AND 131.

Dome to be 28 inches outside diameter, height of dome to 26 inches measured on the line $b_5\ c_5$ metal $\frac{3}{8}$ of an inch thick, lap $2\frac{1}{2}$ inches, and the center of lap to be on the line $b_1\ c_1$. In this example we have simply two cylindrical surfaces intersecting each other; it is required to develop or lay out the cylindrical surface B and to lay out the shape of the hole in the cylindrical surface C. Draw the plan of dome as shown in Fig. 131, the diameter of the circle here shown must be equal to the diameter of the dome less the thickness of metal, hence we have $28'' - \frac{3}{8}'' = 27\frac{5}{8}''$, which is the diameter of the circle. Through the center A draw a vertical line $x\ y$, also through the same center draw the diameter from 1 to 9 perpendicular to $x\ y$. From any point as D as a center and on the line $x\ y$ draw the arc $C\ C_2$ to represent the outside crown sheet; this arc will intersect $x\ y$ in the point c_5; on the line $x\ y$ lay off a point b_5 26 inches from c_5, through b_5 draw a line $b_1\ b_9$ perpendicular to $x\ y$, through the point 1, Fig. 131, draw a straight line parallel to $x\ y$, intersecting the line $b_1\ b_9$ in the point b, and the arc $C\ C_2$ in the point c_1. also through the point 9, Fig. 131 draw a straight line parallel to $x\ y$ intersecting $b_1\ b_9$ in the point b_9 and the $C\ C_2$ in the point c_9, the straight lines, $b_1\ b_9$, $b_1\ c_1$, $b_6\ c_9$, Fig. 130, represents the dome as it would appear when placed on the outside crown sheet. Divide the circumfererence of the circle Fig. 131 into any even number of equal parts, say 16, as shown, and mark the points of division 1, 2, 3, etc., through the points 2, 3, 4, etc., draw straight lines parallel to $x\ y$; these lines will intersect the line $b_1\ b_9$ in the point, $b_2\ b_3\ b_4$, etc., and also intersect the arc $C\ C_2$ in the point $c_2\ c_3\ c_4$, etc. The lines $b_1\ c_1, b_2\ c_2, b_3\ c_3$ are the auxiliary lines assumed to be drawn on the outside of dome

Let *MNOP*, Fig. 132, represent the edges of the plate on which the dome sheet is to be layed out. Parallel to the edge $M\ N$ and close to it, draw the straight line st, draw the center $A\ d_9$ perpendicular to $s\ t$, on the right hand side of the line $A\ d_9$ draw a straight line $d_1\ e_1$ and also on the left-hand side of $A\ d_9$, draw another straight line $d_1\ e_1$ both perpendicular to $s\ t$; these lines represent the center of the vertical lap of dome, and therefore the distance between the point d_1 on the left and the point d_1 on the right must be equal to the circumference of the circle in Fig. 131, which is 86.78 inches. On the line $s\ t$ divide this distance of 86.78 inches, or in other words divide the distance between the points d_1 and d_1 into 16 equal parts, and mark the points of division $d_2\ d_3\ d_4$, etc., through these points draw straight lines perpendicular to $s\ t$, and on these lines lay off points $e_2\ e_3\ e_4$, etc., in the following manner, make the distance between the points d_1 and e_1 equal to that between $b_1\ c_1$ in Fig. 130, $d_2\ c_2$ equal to $b_2\ c_2$, $d_3\ e_3$ equal to $b_3\ c_3$, and so on. Through the points $e_1\ e_2\ e_3$, etc., draw a curved line, and on the outside of this line draw another curved line $S\ A\ T$; the distance between these two curved lines must be equal to the lap, namely, $2\frac{1}{2}$ inches. On the outside of the line $d_1\ e_1$ on the right, add one half the lap, that is $1\frac{1}{4}$ inch, and also add $1\frac{1}{4}$ inch on the outside of $d_1\ e_1$ on the left, as shown by the shaded parts, cut the sheet to the straight line $s\ t$, Ss, Tt and the curved line $S\ A\ T$.





HOW TO LAY OUT THE HOLE IN THE OUTER CROWN SHEET.

Draw the horizontal line $f_1\ f_9$, Fig. 133. On this line lay off the points $g_2\ g_3$, etc., in the following manner: The distance between the points f_1 and g_2 must be equal to the distance between the points c_1 and c_2 measured on the arc $C\ C_2$, Fig. 130; the distance between the points g_2 and g_3 must be equal to that between c_2 and c_3; the distance between the points g_3 and g_4 must be equal to that between c_3 and c_4, and in a similar manner the points $g_5\ g_6$, etc., are found. When all these points have been correctly located, then distance between the points f_1 and f_9 will be equal to the length of the arc from c_1 to c_9, and not equal to the straight line $b_1\ b_9$. Through the points $g_2\ g_3$, etc., draw straight lines perpendicular to the line $f_1\ f_9$; make the length of the line $f_2 f_{16}$ equal to that drawn between the points 2 and 16, Fig. 131; the length of $f_3\ f_{15}$ equal to that between 3 and 15, and so on, and always keeping the centers of the lines $f_2 f_{16} f_3 f_{15}$, etc., on the line $f_1\ f_9$. It is always customary in locomotive boilers to flange the outer crown sheet up into the dome, as shown in Fig. 121; we must therefore allow in Fig. 133 some metal for flanging, as shown by the shaded parts, hence inside the curved line $f_1 f_2 f_3$, etc., draw another curved line $h_1\ h_5\ h_9\ h_{13}$, the distance between these two curved lines must be equal to the lap, namely, $2\frac{1}{2}$ inches; cut the hole in the sheet to the curved line $h_1\ h_5\ h_9\ h_{15}$.

A dispatch from London, July 24th, says: "The Commission on Trade Depression has made its third report. It found that the supply of gold had decreased and that the demand had increased. While the returns from external trade showed little diminution, the volume of money value, owing to the fall in prices, appeared to be greatly reduced. It is the opinion of the Commission that the fluctuations in the relative value of gold and silver have caused serious losses, tending in certain cases to divert the course of trade and aggregate the depression. The Commission strongly advises that a searching inquiry be made into the currency question.

The St. Louis *Railway Register* keeps on its first page two standing announcements, one of which is unique in its way. The first solicits "correspondence and information concerning railway matters," and winds up with the cheering promise, in italics, that "*everything so furnished* will be used in some form." Below is the intimation that "shrewd advertisers will appreciate the superiority of a journal conducted in this way."

We should think they would!

Shop Observations.

BY FRANK H. TRACY.

To fasten an old engine cylinder on a lathe and adjust it so that a tram or tool will just touch all around in the counter-bore at each end, where you have nothing but blocks and wedges, is a job which often draws from the man in charge a series of remarks that seem to indicate a great mental pressure seeking vent in words some of which are more forcible than elegant. Some of the above worry and loss of time can be avoided, by making four jacks in the following manner, viz.:

Take 8 pieces of wrought iron pipe 2″ diameter and 1″ long; cut right-hand threads on 4 pieces and left hand on the remainder. Then make 4 sleeves 2″ long with threads inside to fit the pieces of pipe so that they may be easily screwed in by hand. A number of holes should be drilled through the sleeves to admit of the use of a spanner or key wrench. It is well to roughen the ends of the short pieces of pipe where they come in contact with the work to prevent their slipping while the sleeve is being turned, to raise or lower the jack.

A flexible rule is a very convenient thing to have at hand sometimes, but once in a while we find a place where we are unable to use any of the rules now made because of their not being quite flexible enough. To overcome such a difficulty just make one for yourself by laying a piece of tin foil on that new scale you just bought, and after smoothing out the foil carefully and pressing it over the edges and ends of the scale, take a thin piece of wood and rub the foil until all the graduations appear distinct; trim around the ends and edges with a sharp knife, and you will have quite an accurate rule that is flexible. The cost of your trying one will be slight, as the foil for a small one can be procured from the man who chews fine cut.

I was interested very much by some attachments to a boring mill for car wheels, which I saw in a railroad shop recently, and as the man who was in charge of it does not object to anyone using the ideas, I will try and explain them. One was a way of getting rid of the borings which fall to the floor and inside the base of the machine. Underneath the base he had a tin funnel large enough to catch all the borings as they fell, and at-

tached to it a pipe which extended on an angle downward until the end was beyond the outer edge of the base of the machine. Here it deposited the borings in the pockets of a little elevator, which carried them up from beneath the floor and neatly dropped them in a box at the back of the machine where they were out of the way of the operator, and could be taken out of the shop without loss of time. The elevator was driven from the machine so that it was always ready for business whenever the mill was used.

In this particular machine the spindle was moved by means of a rack and pinion in connection with a worm-wheel and worm, the worm-wheel being arranged so that it could be disconnected from the worm in order to raise or lower the spindle quickly. On the end of the spindle or shaft, which carried the pinion and worm-wheel, was a pointer or indicator about 8″ in length, fastened with a thumb screw, so as to revolve with the shaft. Back of the indicator, and secured to the frame of the machine, was a graduated dial, so that if it was required to take ½″ from the hub of a wheel the measuring could all be done by setting the indicator at *o*, throwing in the worm and feeding the cutter automatically until the indicator reached the ½″ division or mark on the dial. This device could be applied to a large number of the drill presses now in use, and would be of great use in drilling holes of a given depth.

To determine how much a wheel was out of true on the inside of the flange, the following was used: A piece of steel about 14″×1″×¼″, one end drawn out and bent similar to the leg of an inside caliper; a hole was drilled through the bar near the bent end, and a stud set in the frame to receive the bar and allow it to move freely. A short, pointed piece was fastened at the other end by a thumb screw to adjust the bar if required; a light spring held the bent end in contact with the wheel while it revolved. At the outer end, fastened to the frame, was an arc having two points marked upon it, outside of which the pointed end of the bar should not move for wheels of the best class.

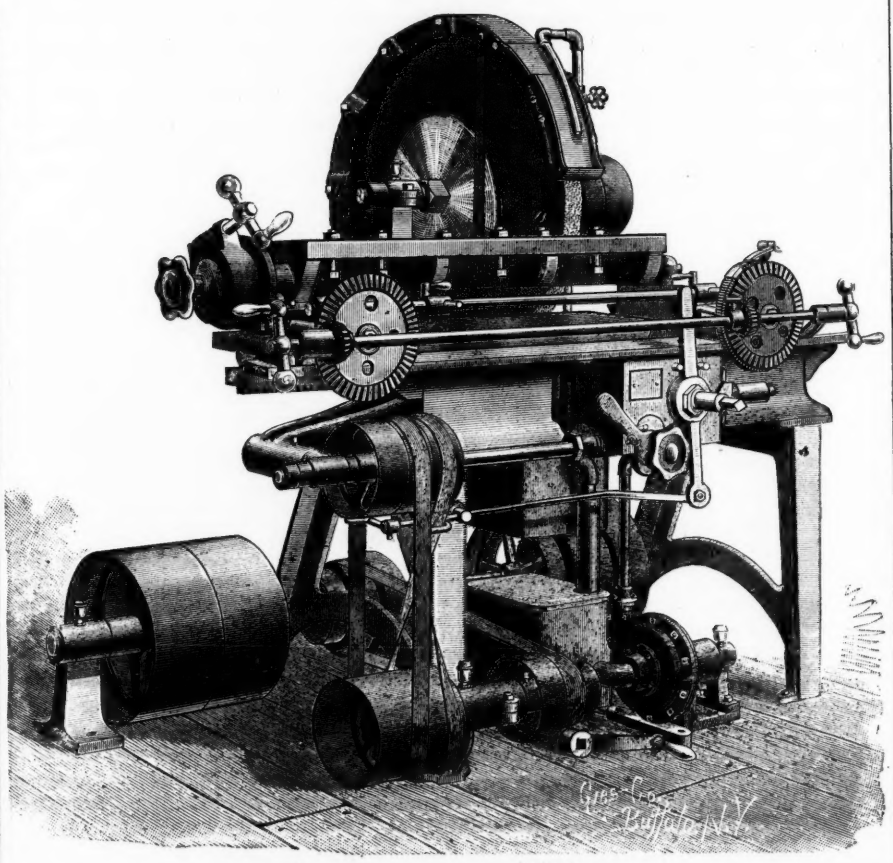
Government Manufactures.

Under the above heading, London *Engineering* prints the following remarks, which are equally pertinent to our own system of navy-yard jobbing:

In making a comparison, however, it should be remembered, in justice to the heads of departments and those under them responsible for the work, that there are causes beyond their control which prevent the various operations being carried on in the most effective manner. The chief of these is the limited control that the technical officials in a royal dockyard have over the work. We have too often exposed the evils that arise from the system of government by naval superintendents of dockyards for it to be necessary for us to say anything on that head here. Until manufacturing operations of a mechanical nature are put into the hands of permanent officials, capable of understanding such operations, and primarily responsible to the Government and subject to the criticism of public opinion, we may wish in vain for any satisfactory record of work done. The more we think upon the subject the more we are amazed at the fact that our dockyards, the vast national manufacturing establishments, should be to so great an extent paralyzed for the sake of affording comfortable berths on shore for naval officers, who can secure the positions. No one, we suppose, begrudges the money that is spent for supporting the naval superintendents and other military chiefs of the large manufacturing establishments. There are few enough inducements, beyond a desire for fame, for young men of ability and position to enter either branch of her Majesty's service, and we would desire to add to rather than take away from their prospects of advancement. That, however, is not the point. So far as the money question goes, the amounts paid for salaries are well spent; but it is impossible for dockyard officials, however zealous and able they might otherwise be, to do justice to the departments they nominally preside over under the present system of control. Such a system will never train up a body of capable and independent spirited technical officials, fit to command in large manufacturing establishments. Certainly, too, good men will not enter from outside, even were they invited to do so, to be subject to the caprices of a succession of half-pay admirals, and to struggle with the petty jealousies and trivial intrigues of the service that have grown up under the present pernicious system. With regard to the returns we have dealt with, it may be said that many of the figures are very fair. But it must be remembered that they only tell half a tale, and even that is not a very flattering one.

Improved Automatic Knife Grinder.

On this machine a folding hood nearly surrounds the emery wheel, which prevents the water flying. A centrifugal pump is attached to the machine, properly piped, with valve to regulate the flow of water on the wheel. The water is taken from a tank located on the floor, under the machine, out of the way, and after being used runs into a second tank, just under the wheel, where the sediment settles and comparatively clean water overflows from the top of this tank into the tank and pump below, thus using the water over and over. The tank catching the sediment is easily taken out and emptied. The pump furnishes a large supply of water, prevents all heating and drawing the temper, and it is claimed grinding can be done twice as fast as when only a small amount of water is furnished; also that the knives are ground true because not sprung by heating.



AUTOMATIC KNIFE GRINDER.

The manufacturers of this machine are the Springfield Glue and Emery Wheel Company, Springfield, Mass.

Wrought Iron as a Material for the Erection of Heavy and Light Line Shafts—The use of Rolled Beams and Bars.

BY W. H. HOFFMAN.

The many rolling mills in the Middle and Western States that are engaged in making the class of iron termed "shapes," have placed in the hands of the mechanical engineer a very valuable material for his use in mill and factory engineering. Rolled beams, I's, channels, angles, "shapes" in various forms, can now be obtained at a very moderate cost. Compared with timber in arranging a set of line shafting they are superior in many ways. They never warp, they do not shrink or swell, and expose no ugly seasoning cracks. If put up in line on proper walls or foundations they will remain so.

Whenever it may become necessary to bolt on extra pillar-blocks or bearings they do not split, and they can be bent to any required form.

In erecting a set of jack shaft frames to support a shaft transmitting 700 to 1,000 horse-power, the iron frame can be constructed at less cost than any kind of a timber one. Seating pieces of cast iron can be riveted on to the wrought beams, these pieces being provided with lugs and flanges for bracing in any direction and for adjustment.

In designing new mills it is much the best plan to arrange for a wrought-iron shaft structure, as by so doing space and light, two very important considerations, are gained, and a moderate use of paint makes this structure indestructible against anything but the fiercest fire, and even in this event much of it is reclaimable. It can be obtained in the most varied widths and depths to suit situations, and the writer has bent it cold to suit special situations, to an extent that he little expected, without the slightest sign of fracture.

No matter what form of building supporting columns is used, wrought, or cast iron, or wood, the shafting stringers and cross-pieces should be of the rolled beam type. But I believe in a wrought structure throughout.

Having a wrought frame for our shafting we have something that we can utilize for other purposes, as by rigging a simple trolley truck to roll on the I or channel beams we have a traverse crane by simply hooking on any of the well-known differential hoists or chain blocks at any point where we can clear the pulleys or belting.

In arranging counters in connection with the main lines, a perfect alignment can be maintained by the use of adjustable tie rods between the wrought stringers so that the belts can be always kept in the center of the pulleys, thus adding to their efficiency materially. As a preventative of fire the wrought beam is a most important factor, for in nearly all the cases where mills and factories are fired from the overheating of the shafting, the flames could easily be extinguished were it not for blazing greasy wooden stringer beams and cross-pieces.

In the matter of changing the position of hangers, on either the main or counter lines, where the wrought stringers are used, they offer by far the easiest methods, and there are several of them, the bridle clamp bolt being one of them, by which any of the hangers can be instantly moved and again clamped firmly to position, "beating" the usual method of boring new holes in "shaky" spruce and pine timbers about four hundred per cent.

Only a few days ago I was talking with one of our large rolling mill owners on this subject, and he said the mills in general were prepared to furnish beams and shapes of any form required in this important item of engineering, and he had often wondered that the mill engineers had not patronized the beam iron men more freely. The probabilities are that in the near future the old timber frames will pass away to be replaced by the light, airy, and strong metal structure.

LETTERS FROM PRACTICAL MEN.

The Poole Grinding Lathe.

Editor American Machinist:

I note the remarks which have been made in your journal in regard to the principle of action and accuracy of workmanship of the grinding lathe invented by J. Morton Poole, of Wilmington, Del., which is probably the most remarkable instance of practical perfection secured by mechanical means the world has ever known. I had the honor of Mr. Poole's acquaintance at the time that he brought out this invention, and he used to award me the credit of being the first person to apprehend the principle upon which it acted. As I have not seen this principle definitely stated, I thought I might add something to the information of your readers on the subject. While what Mr. Rose says about the action of the lathe is correct, it seems to me he has not gone to the root of the matter, or given the true explanation of its source of accuracy. It is true that the two grinding rolls acting as calipers secure an equal diameter at all parts of the roll; but it is equally true that if the roll was slightly bent or eccentric when these grinding calipers were set at work, they would not correct such curvature or eccentricity. Now, the fact is that the Poole grinding lathe not only produces rolls of equal diameters in all parts, but mathematical cylinders, in which every cross-section is a perfect circle, each equal to every other, and all absolutely concentric with a straight axial line. And herein is the wonder. This ideal axial line is the gauge by which the rectitude of the roll is secured. In other words, the machine grinds the roll to an ideal straight line, which ideal line is entirely unaffected by the quality of workmanship in the tool itself.

Perhaps I can make this plainer by a description of the process. A roll having been turned as accurately as a well-made lathe can be made to perform, the bearings upon which it is to rest in the grinding lathe are made as true cylinders as possible by grinding in the ordinary manner. Resting upon these the roll revolves around an axial line connecting the centers of these bearings, which line is mathematically straight and without motion. The roll is now submitted to the action of the grinding wheels, which at first are clamped so that they have not the free swinging motion of a subsequent part of the process; in fact, a single wheel, during this part of the process, may perform all the work. By this means every cross-section of the roll becomes a true circle, concentric to the axial line around which it revolves, but the surface partakes of all the inequalities of the ways by which the grinding wheels are guided. If they are not straight the surface of the roll will be a series of curves precisely corresponding, but at all sections accurately concentric to the axial line. After the roll is brought to this condition, the two grinding wheels are adjusted to grind upon opposite sides thereof, the frame in which they are fixed being suspended upon the carriage, so as to move freely in a direction normal to the axis. At first they are adjusted to only touch those parts of the roll which are the largest in diameter, reducing the same without disturbing the concentricity. This action is continued until all parts of the roll have become of equal diameters, when it is as straight as the ideal axis, because every fraction of its length is an equal, perfect circle, having this axis for a center.

Mr. Rose has not written too enthusiastically of the great accuracy secured by this machine. As an instance, I have seen two rolls taken at random and placed with their surfaces in contact while lying upon the same horizontal face-plate; a slight end motion being given to one of these rolls produced an unbroken bright line of contact upon both. Now, Sir Joseph Whitworth demonstrated that one-millionth of an inch would break

the line of contact, so that these rolls, each 7½ feet long, were both of them true to within one-millionth of an inch.

The criticism of Mr. Smith shows how dangerous it is to express an immature judgment about a thing upon which one is not posted. Facts outweigh theories. What he says cannot work does work perfectly, as hundreds, if not thousands, of rolls ground in the last fifteen years in this country and Europe testify. His criticism upon the action of the belt is equally unfounded. The ingenious way in which the grinding wheels are driven avoids all side strain upon the swinging carriage, the strain upon one wheel exactly balancing that upon the other. In practice the driving drums are larger than shown on the drawing given by Mr. Rose, so that the belts are nearly perpendicular, but that makes little or no difference, if the angle is not great.

An interesting fact which I have not seen noticed is, that the lower member of a stack of rolls requires to be ground somewhat larger in the middle than at the ends, to allow for the natural sag of the roll when supported at its extreme ends. It has been said that nothing can be made so stiff that it will not spring when a force is applied to it. Here is one of the illustrations of that fact. A roller 14 inches in diameter, 7½ feet long, cast hollow, with its walls 2 inches thick, ground to absolute truth, when supported upon its bearings sags one-thousandth of an inch in the center, as I have seen demonstrated by Mr. Poole. To correct this difficulty the roll was replaced in the lathe, with one bearing elevated so that the axis was out of parallel with the plane in which the grinding wheels traveled. Now, by adjusting the grinding wheels so that the line joining their centers passed through the center of the roll at the ends, at the middle of the roll this line becomes a chord instead of a diameter, and the roll is ground correspondingly larger. This practically corrected the difficulty, although not mathematically exact, as I pointed out to Mr. Poole, the curve being composed of two intersecting hyperbolas with curvatures in the wrong direction, instead of being a true catenary. The difference, however, is less than the elasticity of the "chilled" surface of the roll.

A similar operation, but with the line joining the centers of the grinding wheels coinciding with the diameter of the roll at the middle of its length, was used by Mr. Poole to grind rolls for making sheet iron, the diameter of which at the middle was less than at the ends, to allow for the difference in expansion occasioned by working hot metal. The curve thus made is a true hyperbola, and is correct for the purpose.

GEO. H. BABCOCK.

Spacing in the Milling Machine.

Editor American Machinist:

There seems to be, so far as my experience goes, a very vague understanding of the index dividing head of universal milling machines—not that it is such a complicated piece of mechanism, but because there is a chance to do some thinking and a little figuring, which, I am sorry to say, some of the boys are averse to. A table of circles, turns and holes may be a very handy thing to have around when we want to cut a gear or do some other than the common spacing, which, no doubt, may come out on a number of whole turns, easily remembered. But if a person is unable to find the right index-plate and circle, without the index-table before him, then the machine is superior to the man, for it contains inherent powers, which he cannot control.

A simple rule, which will apply to any milling machine head, when the spacing is done with a worm-wheel, is: Make a fraction in which the number of the teeth in the dividing wheel is always the numerator, and the number to be spaced or cut is the denominator; then, if the fraction is improper, reduce it to a mixed number, when the integer part will represent the number of whole turns, and the numerator of the fraction the number of holes to be taken in the circle, whose number is expressed by the denominator—a long rule in words, but short in practice.

An example or two applied to Brown & Sharpe machines may make it plainer. The index worm-wheel has 40 teeth. Suppose we want to cut 90; we make the fraction thus $\frac{40}{90} = \frac{4}{9}$. Now we find that 9 will divide the index circles of 18 and 27, which are the only ones they furnish that it will divide; now, $18 \div 9 = 2$, and $4 \times 2 = 8$, or 8 holes in the 18 circle, which is ever so much easier, if the index-plate containing that circle happens to be on, than to hunt up the table and find it, say $\frac{12}{27}$, and make the change.

Again, suppose we wish to cut 6. As before, we say $\frac{40}{6} = 6\frac{4}{6} = 6\frac{2}{3}$. Now we have the 6 whole turns sure, and two-thirds of another turn. The table says $6\frac{26}{39}$, but we may use either the 15, 18, 21, 27 or 33 circle, using either 10, 12, 14, 18 or 22 holes, respectively, instead of as by the table.

CHAS. S. BEACH.

Bennington, Vt.

A Planer Job.

Editor American Machinist:

When having but a few tools in a common repair shop, and only two or three men, I occasionally run against a hard tooth to pull. It came about, a few days ago, that a 10″ flange T was sent out of the shop—boiler connections without being planed—while it was very essential that the T should be planed on all three sides. Now, it's one thing to get a job, and another thing to get it done with nothing to do it with, comparatively speaking.

There were two lathes in the shop, but neither would swing the T, and it was of no use to think of a boring bar—the feed could not be worked satisfactorily. It was of no use talking of the drill press; so, finally, the planer was decided upon as the tool to do the job. The T being twice the length of the breadth, I could plane the breadth, but could not get at the length. Finally, the AMERICAN MACHINIST furnished me the idea, as some time ago I had some large zinc plates to plane ½″ thick, 6′ × 4′ wide, on this same planer, and the information furnished was in Questions and Answers, No. 276, July 17, 1886, which enabled me to do the job.

After having taken the advice you gave for the zinc plate job and worked it out successfully, my planer was neither high enough nor wide enough to plane ends of T, but I planed the surface which I could get at, and then the work would swing all right after the single end was planed.

I followed the suggestion before made of stripping the housings, and I did strip off top and one side of my planer, took my crosshead bar off and stood it on its end, and bolted it to right-hand housing. I retained the feed-clutch on it, and then I could feed up and down at my leisure. By putting a brace 6 × 2 on the opposite side of cutting tool, I made a very solid and substantial job of it. For feeding my clutch gear came exactly on a line with planer platen, and I got the smith to make me a spring some 10″ long, 1¼″ wide, and 5″ of it drawn down to ½″ wide, ⅛″ thick, with small latch point on it. I put two holes in to correspond with planer platen holes, and bolted it in its place; so, when the planer was coming to its work, it just fed back three teeth, and when it reversed it worked the ratchet clutch gear, and it did work tip top. I was surprised to see so simple a contrivance effectively save dollars and cents, as the expressage on this pipe would have been something of an item, beside the delay, if it had been sent away to be fixed up.

Hoping that this may be of benefit to some of your readers, I contribute the same, hoping that some of them will take hold and write, and give us youngsters a chance to crop from the customs of our brother workmen. If we all send a unit, there will certainly be a benefit to some of us.

N. P. MIVILLE.

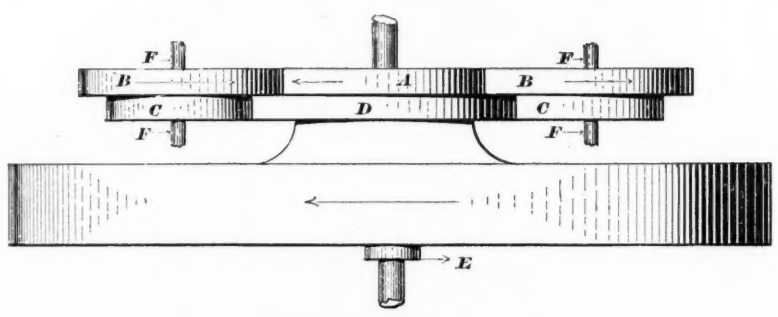
Compound Gearing on a Strike.

Editor American Machinist:

A few days ago I saw some rawhide gearing, destroyed in a rather peculiar manner. Thinking it might prove interesting to some of the readers, with the aid of sketch inclosed, I will endeavor to make the important points plain as possible.

A and *D* are common cut gears, having 50 and 67 teeth, respectively, 5 pitch (diametral).

Gear *A* is keyed to shaft, which carries a driving pulley above (not shown), all shafts being vertical, as represented. Gear *D* is attached to a heavy cage, which runs loose on the shaft, and is supported by the collar *E*; bolted together and keyed rigidly on their shafts, which run in bearings at *F*, *F*. There are two pairs of rawhide gears, *B*, *C*, similar to back gearing on a lathe, the two pairs being used instead of one for the purpose of distributing the otherwise one-sided strain on the central shaft, and having respectively 50 and 33 teeth. This arrangement was run—gear *A* driving the rest, as shown—six hundred revolutions per minute, in a round iron air-tight tank. After running about an hour, the belt began slipping, and the whole thing stopped; and on removing the upper half of tank, the rawhide teeth were found chewed and mashed out of all original shape, excepting about six teeth on one side of each pair, which were in good condition.



COMPOUND GEARING.

Starting at the good teeth on wheel *B*, and turning it around, they appear worse and worse, until the opposite side is reached; then better until you have reached the good ones again. But instead of showing wear on the rear faces, as any driven gear should, it was on the advancing faces, excepting those few good teeth which were worn slightly on the proper side. Now, the wheels *C C*, being the drivers of wheel *D*, should, under ordinary circumstances, show wear on the advancing side of the teeth; but to the contrary, from the show of excessive wear on the rear faces, they seem to have been making a serious attempt to run backward. What was the cause of this? and why were not all the teeth treated alike?

We have had not a few arguments over this; but so far, I think the balance of evidence is in support of the following explanation: On examination, I find gear *A* was turned $\frac{3}{80}$″ too large in blank for the pitch and number of teeth, gears *C C* ⅛″ ditto; gear *D* was about $\frac{1}{80}$″ under size. And having had the teeth cut to the proper depth from the periphery of blank, as is the usual practice, those on *A* and *C* were necessarily of greater pitch (slightly, understand) than those on the other wheels.

Now, gear *A* having teeth of greater pitch than those on *B*, there would be a tendency to "hurry" the latter, when first started; and if the motion had been slow, there would have been some chance of adjustment, and no damage done worth notice. But remember, *C* being positively obliged to turn with *B*, and having an excessive pitch also, would still farther accelerate the motion of the heavy and inert cage that, when once started, ran perfectly free, which immediately began crowding the advancing corners of teeth on *D* into the rear faces of those on *C*, and the advancing faces of those on *B* against the rear corners of teeth on *A*. All this chewing and crowding tended, one might say, to check the unnatural impulse given the cage, and when its driver had about completed a turn, it settled back to give the belt a chance; that's where the good teeth had an opportunity to go through without getting bit. This thing occurred every time the driver made a turn; the pulsating roar, which came from the tank while those gears were discussing "diameter and pitch," was proof of it. Did you ever watch an impatient engine starting a long train of empty box cars? It sends a rattling jerk clear to the rear car, and the recoiling draw-bar springs return the compliment by sending it back to the tender. Isn't this a similar case?

W. H. CHAPPELL.

Chicago, Ill.

Engine Cross-Heads.

Editor American Machinist:

A letter from Professor John E. Sweet contains the rather bold statement that "There is nothing about an engine that can be two or three times too large and do so little harm as the cross-head pin." To this I am disposed to take exception, and claim that a surplus of wearing surface between the cross-head itself and the guide or slides is the place where, to use his own expression, a little too much is just enough."

If there is anything that would be likely to confound a young engineer, it would be attempting to determine, by reference to the best practice of the day, the proper amount of wearing surface for an engine cross-head. One engine builder, and one that, it must be acknowledged, has more than a fair reputation, uses a cross-head with a bearing surface not much exceeding one-tenth the area of the piston; and another builder of about equal popularity uses, in some cases, cross-heads with wearing surfaces about one-quarter larger than the entire area of the piston.

In one case the engines are smaller than in the other, but with probably about the same intended piston speed. The one engine builder claims that his cross-heads are perfectly satisfactory, because there are simple means of compensating for wear, and that the engineer can take up slack every week, or every half day, for that matter, if necessary; while the other engine builder is not fully satisfied with his, as they will wear a little, and ought to be adjusted as often as once a year, but the engineer neglects to do it, and he wants a cross-head that never needs any attention at all.

These are extreme cases, and the relative sizes of cross-head wearing surfaces, and the relative dispositions of engine builders may be found scattered all along between. The young engineer seeking for information on this subject, can adopt any proportion, and find honorable precedent for the proportion he may adopt.

It is true that there are varying conditions involved, such as long or short connecting rods, high or low pressure, high or low speed, the nature of the wearing surface and its form, and the mechanical construction of the cross-head itself—all these have a bearing on the question; but an accumulation of all these varying conditions, in one way or the other, cannot account for the great difference in the proportions in common use.

When one factor in a problem has greater weight than all others combined it is well to consider that factor first, and we may find it useless to go any further. The ruling factor on this crosshead wearing surface question is probably one of dollars and cents. One builder schemes to build his engine so cheap that he can pay for advertising, pay an agent for selling, set his prices below his competitor and still make money. To do this the cost must be cut down at every point, and generous wearing surfaces means more than simply the cost of making them, for it means absolute alignment, which many times is the most costly thing of all. In this feature of alignment the original Corliss crosshead possessed an element of self justification, so to speak, that no other engine builder except of Corliss engines has had the

sense to steal, and one which Mr. Corliss himself has for some reason abandoned. Those who are familiar with the original Corliss arrangement will remember that the wearing surfaces of the crossheads were separate blocks, the pressure coming on a central point, and to a certain extent these blocks were self-adjusting, so that however much the crosshead, guide or piston might wear out of line, the wearing surface always rested fair on the guide. It is hardly possible that the V form of guide for a horizontal engine is as good as a flat one, and the same objection exists, to a certain extent, to the concave or bored guides; they are more difficult to keep lubricated properly than a flat one where the crosshead overruns the guides at the end, and laps up the oil from pockets, and when the side guiding is done by side ledges on the guide. The above relates to stationary horizontal engines. Locomotive and portable engines for certain reasons may not be as well if so constructed.

Because of the fact that the locomotive four-bar guide style is the most extensively used, is very popular and gives good results, it does not follow that it is for the horizontal stationary engine the best, and there is one thing at least against it—it is not the most simple. In the Corliss or girder-frame sort there are but two guides to make straight and care for, and in the slipper-guide sort there is mainly but one. This, the slipper-guide sort, requires that the engine be run in one direction—that is, with the crank moving away from the cylinder when above the center; otherwise, in its action, it is the same as the Corliss pattern. The theoretical objection to the two latter sorts is that the sliding surface is below the center of pressure, and therefore tends to tilt the crosshead, and, while this is true, it does not develop any defects when the sliding surfaces are of sufficient length. When the length of the crosshead equals the length of the stroke, and the sliding surface is as near up to the center as the connecting rod will admit, no tilting occurs, or, at least, not enough to wear the crosshead more at the ends than in the center.

Many engine builders have increased the lengths of the crossheads of their engines, and at the same time done another thing worse than useless—increased the length of the slides. There is no reason why they should be any longer because the crosshead is, and they will keep straight much longer if left short. Upon what theory some of our best engine builders work, who locate the crosshead pin completely at the crank end of the crosshead, is a mystery. Or, rather, that does not appear to be what they do. It would appear that they built the crosshead all right at the piston-rod end, and then cut off the two projecting horns that ought to extend out towards the crank to bring the pin in the center, and so not only make the wearing surface ridiculously short, but put the pressure all at one end. One can hardly think that this is always due to a question of cost, for it may be found on engines in other respects of the highest character.

J. G. Tramis.

Steam and Furnace Heat.

Editor American Machinist:

From the articles lately appearing under the above title, one would conclude that furnace heating is uncertain and costly, and that steam heating is inexpensive and satisfactory.

One article alone, I believe, appeared in favor of the hot-air furnace. The cases presented have no doubt been extreme ones, and have greatly exaggerated the difficulties encountered. It has been represented that the hot-air furnace was subject to drafts of air, was dangerous to health, was uneconomical and generally was uncertain and unsatisfactory. The accusers make strong points against the hot-air furnace. I will admit that probably many furnaces can be found in the country in which every particular failing abovementioned can be found.

I claim, however, that a furnace properly constructed and set will not possess any of the above failings, provided heat has to be carried not to exceed twenty feet horizontally. The hot-air furnace has not received the study that has been bestowed upon the more complicated steam-heating apparatus. The setting and location has frequently been entrusted to inexperienced and ignorant tinsmiths. No study, or even thought, is given to the location or dimensions of the air flues to or from the furnace. The result is that some jobs work well, other jobs work badly.

I will mention concisely a few points that should receive attention, for which I think no reasons will be needed.

The cold-air shaft should take its supply from positions where it will not be affected by winds. A shaft passing downward, like a chimney, from the top of the house, is an approved form.

If there is a large hall in the house it can be arranged to draw a supply of cold air from that at times.

Each room should be provided with shaft for removing cold air. Hot-air flues should be wrapped to prevent radiation; should be of proper size, and should enter room on windward side. Heated air should pass over a vessel of water.

The above precautions, all essential, are frequently not even considered. There is no reason why a small house cannot be warmed more economically by hot air heated by a furnace than by steam,

Steam heating is not always perfect, and I know of more than one instance where all the evils complained of in the article of April 10 have been met with.

Despite the apparent safety of the low-pressure apparatus for house heating, I know from experience that it is not as safe as it seems. No automatic apparatus that has been devised is safe against the curiosity of an ignorant servant, who usually attends it. I know of one case where the boiler "went dry," and was filled when very hot, with disastrous results. Steam heating on a scale sufficiently large as to need a competent engineer, is without doubt the most economical and safest way of heating. The direct way of steam heating is very likely to give a dry atmosphere, even worse than that from furnace heat, and that is particularly bad, not only on people but on furniture. We have tried various methods of supplying the air with moisture, and so far have not been able to do this automatically and with certainty. Occupants of a room, although they may know what is the matter, are likely to suffer rather than to take the trouble of applying a remedy. The amount of moisture that is supplied by the porosity of the pipes, as indicated by Mr. Munsell, is, if anything, not appreciable.

One writer says that a low-pressure steam apparatus will last fifty years without trouble. That may be so, but I do not believe it. I have charge of one large building "piped" seventeen years ago, and that has been heated up to this time by low-pressure steam. The last two years we have had more or less trouble by the failure of pipes and fittings, caused, without the least doubt, by rusting through. In many cases the fittings became as thin as paper before failing.

I do not see how a claim for great durability of steam pipes can be made, for the conditions for rusting out are as favorable as can be devised. We have heat, air and moisture acting continually or alternately on the inside of the pipes. My own opinion is that steam heating is most economical and satisfactory only when it is on a sufficiently large scale as to require the services of a skilled man, or when the building is so large as to render the transmission of the heated air current uncertain. There is no doubt but that if more thought and attention were given to each individual case, the efficiency of furnace heating would be much increased.

R. C. Carpenter.

Lansing, Mich.

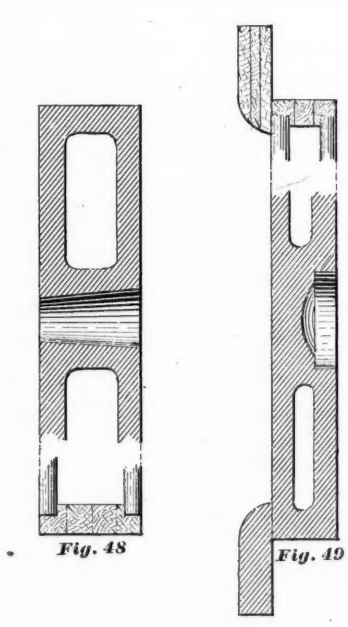


Fig. 48

Fig. 49

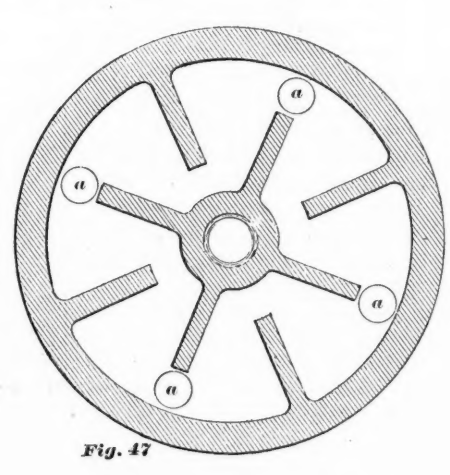


Fig. 47

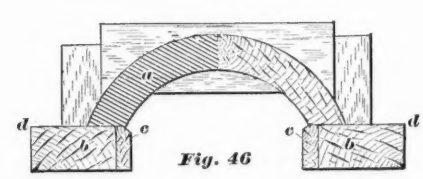


Fig. 46

Patterns for Steam Cylinders.

By F. W. Barrows.

As the steam cylinder pattern would not be of much use by itself, let us now construct the rest of the job.

The cover for steam chest is not a very difficult pattern to make; the trouble lies in keeping it straight after it is done. It is evident to any one that a flat piece of wood in the shape of this pattern is very liable to warp. The common way of preventing this is to screw on some pieces across the flat side; these are to be stopped off by the moulder. A better way, and one that is usually successful, is this:

Select a good piece of lumber 1½" or 2" thick, which has no shakes, and has kept flat and straight while drying. Saw this board into strips of a width equal to thickness of stuff you will need to get the pattern out of. The stuff should be dressed down flat and straight before sawing up. This makes all the joints much quicker than could be done after the stuff is cut into strips. Lay the strips down side by side in the position they occupied before sawing apart. Suppose them to be numbered 1, 2, 3, 4, etc., beginning at one edge of the original piece. No. 1 will be the first strip cut from the edge, place 2 on top of 1, then 3 on 2 and 4 on 3, and so on to the end. Glue them together in this shape, and you will have a piece of stuff that will keep straight in places where the original board wouldn't stand at all.

After this piece has been dressed to the right thickness put on the strip which forms the extra thickness of cover around the edge. When this piece runs across the grain of the first piece don't use any glue, because when the first piece swells or shrinks if you have glued anything across the grain, it will tend to prevent that side from shrinking or swelling with the rest of the piece, and when a board shrinks or swells more on one side than the other, the boards warp. So put on whatever goes across the grain of a pattern like this with nails, thus allowing the board to come and go, which will tend to keep it in better shape.

This manner of constructing the pattern is for a cover which is simply a flat piece of iron. If it has ribs running across it perhaps these may be in such shape as to keep it flat without any further precaution.

The valve shown in Fig. 46 is a plain *D* valve, and can be made to leave its own core by making the pieces which form the shoulder at *c c* loose. To make the pattern get out a piece of stuff having a section like *a*, and long enough to go way around the pattern at the lower side, then you can miter the corners and glue the whole together on a flat surface. After the glue has set, nail the joints. Get out the piece which is to form the face, leaving off the parts marked *c*, as they must be loose.

This part forming the face had better not be mitered at the corners; cut the sides between the ends, thereby cutting again in the side pieces. The loose pieces will be held in place by the tenons and shoulder. If this loose section extends all the way round, leave a good shoulder as at *c*, then miter the loose pieces at the corners, then when all are in place they will support themselves. In case it is considered best to make this pattern with a core for the inside, I would make it solid, putting on a print at the bottom about ½" thick. Make the core-box with a joint at the upper edge of flange on line *d d*, not forgetting to put a piece in box to form that part of the sleeve for valve stem which shows on the inside of valve. The core prints for the valve stem should be carried down to the body of valve and given plenty of draft, then make the core-box so that the core will fill up the prints.

The piston, as I have shown it, is made all in one piece and cored out. This, I suppose, would be condemned by some builders, who would prefer to make the piston in two parts and bolt them together, which would also do away with the necessity for a core.

Glue up the ring to form pattern in cants or segments, cutting the heads into the ring on each side, turning a recess to receive same and putting in some pieces across the grain of heads, between them to support them. Now put on four prints to support core, placing at points marked *a* in Fig. 47.

If the supporting partitions in casting are put in in the shape I have shown, the core will be all in one piece, and can be supported by four prints, as I have shown. If the partitions are carried completely across, thus dividing the core into segments, then each segment must be supported by from one to three prints. As the holes made by prints in castings have all to be tapped out and plugged, the fewer holes the fewer plugs to fit in.

Make your core-box by building up a ring in cants on a good bottom piece, which is thick enough to get in the length of prints. After the ring is turned out, space off and cut the four holes which will form the prints on cores. Then fit in the radial ribs, as shown in Fig. 47, and your core box is done. Fig. 48 is a section of cylinder. If the core is divided by ribs into segments the core-box will also be only a segment of the whole core. The hole for piston rod will require a core-box.

The cylinder head, Fig. 49, should also be glued up in cants, putting the inner side next face plate. In gluing up, and when you get to the right height for putting in the outside head, turn off the face of cants, cut a recess to receive the head, and after fitting it in, glue on the flange in three courses of cants. I always try to put not less than three courses of cants in any piece for a pattern, as one course is really no better than a ring made of one piece, and two courses won't stay in shape, therefore three courses is the least that you can put in and make a good job.

This cylinder head is shown cored out in the same shape as piston. The prints for supporting core will probably be located on the inner head, and the core-box should be made in the same way as box for piston. If the cylinder is a part of a tandem compound engine the head would have a stuffing box and gland for rod connecting to the other piston.

The gland for stuffing-box on steam chest for valve rod will require no explanation.

"Patented" land is advertised for sale in the Denver, Col., papers. The land may be patented, but not much of it is "improved."

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NEW YORK, AUGUST 21, 1886.

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Steam Users and Coal Buying.

"The summer season," said a provident housekeeper, "is the time when you can buy what you don't want, real cheap." It is also the time when the provident steam user can contract for a year's supply of coal that he is sure to want, on equally favorable terms. Or at least such has been the case for several years past. The pending completion of the Schuylkill branch of the Pennsylvania Railroad, coupled with the increasing disposition of steam users to use bituminous coal, would seem to favor for the future a healthy continuance of the existing competition among anthracite coal producers.

As a case in point, we have in mind the experience of a steamboat company in the vicinity of New York, all of whose vessels use pea coal. For the past two summers, the company have been able to make yearly contracts for their coal at prices so far below those of the preceding year as to make the saving amount to a perceptible dividend on their capital stock. This year the special variety of pea coal, from which their experience has led them to expect the best steam-making results, costs them, throughout the year, $1.85 per ton, in 150-ton lots, on board vessel in New York harbor. Other free-burning varieties, and perhaps less fancy "brands," could have been bought for less. They make it a point to buy their coal from the producers directly, on a competitive basis, and to arrange to take it, during the year, in full boat-load lots, enabling sellers to quote the most favorable figures possible.

Doubtless most proprietors of large steam plants have fully considered the advantages derived from the use of small-sized coal, and especially at the present discriminating prices. Most large users also, no doubt, follow the plan of buying their year's supply in the summer, at the time when the lowest prices are likely to rule. But there are many, among small users especially, who could, by providing better storage facilities, make arrangements enabling them to contract for their year's wants at the right time, by having coal delivered in quantities such as will induce producers to name their very best figures.

Then, too, in many of the smaller manufacturing towns, a number of users could, perhaps, arrange to "pool their issues" in coal buying, to the advantage of all. We think the experiment would be worth trying.

Railroad corporations seem quite willing to furnish the argument required to demonstrate the necessity of placing sharp government restrictions upon their business. New York merchants in apparently vain efforts to get what they believe to be fair—at least indiscriminating—rates to the West are emphasizing afresh this necessity. They show that goods are shipped to Chicago from points in Massachusetts at rates nearly 30 per cent. less than they can be shipped from New York, a discrimination in some lines substantially prohibitory. It is also shown that Philadelphia merchants find it cheaper to ship goods to New York and then re-ship to Chicago than to ship direct from Philadelphia. We have known instances where machinery could be shipped a roundabout way much cheaper than by nearest route, although the long route was three times the distance of the direct one.

When these things—and they are getting worse all the time—go on until legislative action can no longer be withheld, which will be when such a pressure is brought to bear that legislators will not dare sell out to railroad corporations, then we shall hear the usual howl about government interference with private rights.

The Lesson of the Increased Iron and Steel Production.

It is very generally conceded that there is no better index of the business prosperity than is afforded by the production and sale of iron. In this light it is gratifying to note that the production of pig iron for the first half of the year is greater than in any previous year, and that stock is not accumulating to any noticeable extent. It is also reasonably certain that more steel will be produced this year than ever before in one year. In view of these facts it cannot be otherwise than that on the whole it has been and is to be a fairly prosperous season. More prosperous than some years when spasmodic booms in special directions have made a false impression on observers. If there is any other way than in the direction of general prosperity to explain this increased production of iron and steel, we fail to see it. So far 1886 has been a year of steady general progress, notwithstanding those who compare it with the local business excitement of some other years cannot see it so. Progress that is indicated by steadily increased use of iron and steel is far better than a temporary storm, sure to be followed by a calm.

In judging business by the past, all experience teaches that a short time of unwonted activity in any lines leads many into these lines; then when trade settles down to a substantial basis the number of those engaged is too great, and business, really good, measured by the total volume, appears dull by individual comparison.

Steam Engine Guarantees.

The mechanical head of a well-known firm of steam-engine builders recently offered, as a guarantee on steam engines aggregating several thousand horse-power, a duty equal to two pounds of coal per hour for compound, two and one-half pounds for simple condensing, and three pounds for non-condensing engines. In conversation, he stated a fact that has considerable bearing on steam engine guarantees. It was that, while in this case he expected to be able to obtain a higher duty than that named, he would not guarantee it without an increase in the price. This increased price was not to cover difference in construction or workmanship; that would be identical under either guarantee. But for a certain additional sum he would give a guarantee for a higher duty, which he would name.

The argument is that he could get the first-named duty beyond any question, and by exceeding it considerably the fact that he did get it would be so plainly demonstrated that nothing more than a nominal test would be required. Hence, with this guarantee, the price named would be the same as if nothing was said about economical performance.

In case the guarantee for higher duty—close to the possible limit—was given, there was enough possibility that some little unforeseen difficulty might present itself to prevent its attainment, and it was worth something to take even a reasonably remote chance of this being the case. Mainly, however, what must be provided for in this case comes from the fact that in any event the performance would be only slightly above the guarantee, and probably so close to it that a number of expensive tests must be made to settle the matter.

To those who understand the elements of uncertainty in a steam engine test, this latter view will present itself as a wise precaution. Manifestly, if a steam-engine builder must be to considerable expense to show the consumption of coal to the smallest fraction of a pound; if he must demonstrate this not only to himself, but to other interested parties, with the prospect of a lawsuit in the end, he must get paid for the expensive tests and for the risk he runs, out of the price he gets for his work. If a purchaser exacts guarantees covering these small fractions in coal consumed, he should expect to pay, directly or indirectly, for the tests necessary to get at the facts required.

Reduced Cost of Post Office Money Orders.

Subscribers to newspapers will be glad to learn what is now not generally known, that a new law has just gone into effect, reducing the cost of obtaining U. S. post-office money orders for amounts of $5 and under, from 8 cents, which has heretofore been the rate, down to 5 cents, a more convenient and moderate figure.

We hope this reduction will induce newspaper subscribers and others desiring to transmit small amounts of money through the mails, to discard the unsafe U. S. postal note, which, with the same trouble of obtaining, costs now nearly as much (3 cents), and for which no duplicate can be obtained, if lost or stolen. The U. S. post office money order is an absolutely safe means of sending money through the mails. The U. S. postal note, as the law now stands, is a delusion and a snare

Big Money from a Worthless Mixture.

A large number of foundrymen in Albany and vicinity have been the victims of a man of good appearance, claiming to come from Cleveland, O., who is selling the right to make a mixture for "facing" and lubricating purposes. He exhibits a large book containing recommendations of the mixture and gets from $100 to $500 for it. He has sold it very largely to malleable iron concerns and has disappeared. It is believed he is now in the New England States. The mixture is worthless.

We take the above item from a press dispatch. If it does not refer to Fink, the bogus oil man, as having taken up a new dodge, it certainly describes the doings of a close imitator. Foundrymen have not hitherto, as we believe, been favored with Mr. Fink's attentions. Let them beware of him and all his ilk.

Balloon Repair Shops.

When a new line of transportation is established, one of the questions most interesting to mechanics and business men, is the question: Where will its supply and repair shops be located? That a line of transportation of whatever kind requires machinery and repair facilities of some nature, is a fact patent to all.

The recent successful voyage of a large passenger balloon from Cherbourg, France, across the English Channel to London, in the teeth of a strong breeze, if the press accounts can be relied upon, indicates that such improvements have been made in the steering and propelling machinery employed, as must in time result in the steady elevation of ballooning as an art, as well as of balloons as a method.

As readily-steered and propelled balloons come into general use for transportation purposes, the necessity of convenient and easily accessible repair shops will become more and more a "long felt want." The inconvenience of making repairs to the machinery of balloons in existing machine shops, is plainly evident. The idea of anchoring a big balloon for such a purpose, where any small boy with a toy pistol can readily puncture its inflated side, is one that will surely have to be abandoned.

Clearly the kind of balloon repair shop needed is one located in the car of a monster anchored balloon which can be readily raised and lowered at will, and alongside which other balloons can attach themselves with entire safety and convenience. Such a shop, too, would have other important advantages. It would afford a place where many of the mechanical "inventions," which aim to get something out of nothing, and which are intended to form the nucleus of million dollar companies, could be perfected, without danger of having the patents stolen. Such concerns always "go up in a balloon" sometime or another, anyway, and it would seem less galling to deluded investors in their stock, to have them "go up" in that way, when that expression means merely going back where they came from.

Of course a properly constructed balloon repair shop will require some degree of skill in its architectural arrangement. A sort of auxiliary car or elevator may have to be provided, by means of which the master mechanic, foreman and high-private mechanics generally, to say nothing of apprentices, can be hoisted up and down when urgent necessity requires. As the fuel employed will doubtless be gaseous, in any event, an ordinary flexible tube connection will be all that that is likely to require.

Until the need of such shops is more pressing than it is just yet, we think further details can safely be left to the future, on the principle that it is never worth while to fall through a bridge until you get there. But the topic is, to say the least, a timely one. How far ahead of time it is, we do not, of course, pretend to say.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(299) J. D. B., Judson, Fla., writes us inquiring about a magnetic compass that will point out the location of metals under ground. *A.*—There is nothing of the kind in existence, and J. D. B. should send no money to any party who offers to furnish him with such an instrument.

(300) G. H., Torrington, Conn., asks: If I worked two or three years in a marine engine shop, would I be more likely to get a situation as engineer on a steam vessel? *A.*—It would help you in getting a situation, undoubtedly. See "Examination of Marine Engineers" in our issue of August 7. All the firms named by you have a first-class reputation.

(301) M. G., Cincinnati, Ohio, asks: Can a boiler feed-pump be worked without a check valve? *A.*—It is possible to work a feed-pump without a check between pump and boiler, but it is not a good plan to try to do so. There should be both a check and cock between boiler and pump. In working a pump without check in pipe hot water is likely to back up on pump, making trouble in starting it.

(302) L. E., Milwaukee, Wis., writes: 1. I want to explode gas in a cylinder to form a vacuum. What proportion of gas and air should be used? *A.*—From 8 to 12 volumes of air to one of gas, depending upon the quality of the gas. 2. Will six telegraphic gravity batteries be sufficient to form a spark for exploding the mixture? *A.*—They should be more than sufficient.

(303) If E. L., New York, who asks about shading of drawings, will give his street and number, we will reply to him by mail.

(304) J. H. C., Shanghai, China, writes: I have a circular saw 6" diameter, pulley on saw mandrel 4". My shafting makes 425 revolutions per minute. I cannot make connections to the saw direct. I have one pulley 12"x2" for the line shaft. What other pulleys shall I use to get the desired speed? *A.*—Your saw arbor ought to make 5,000 revolutions per minute for a 6" saw. It may be too large to run satisfactorily at this speed; perhaps you had better speed it a little slower. To do this you can put up a countershaft with a 6" pulley from which to belt from 12" pulley on line shaft. This will give countershaft a speed of 850 revolutions per minute. On this countershaft put a 20" pulley, belting from this to 4" pulley on saw arbor. A belt 2" wide will drive in both instances.

(305) Fly, Philadelphia, Pa., writes: A fly-wheel for an engine is, say, 3 feet in diameter, and of a given weight. If lack of space requires a smaller wheel, how should it be proportioned? *A.*—To make the small wheel equal in efficiency to the large one, its weight should be inversely as the square of the diameter as compared with the larger wheel. If the diameter of large wheel is 3 feet, and that of the small wheel 2 feet, then the weight of the small wheel should be as 9 is to 4 compared with the large one. By weight is meant the weight of rim, and by diameter the diameter measured to the center of rim.

[Owing to misunderstanding of the question, we repeat question 249.]

(306) T. H. M., Waterbury, Conn., asks: Is 3⅛ inches the right diameter at throat for a worm gear of 42 teeth, worm being 4 threads to the inch? *A.*—42 teeth, 4 to the circular inch, calls for circumference of $42 \div 4 = 10\frac{1}{2}$ inches and a diameter of $10.5 \div 3.1416 = 3.342$ inches. The total throat diameter, or diameter to turn the worm at the throat, will be two parts of the pitch greater than this, or $3.342 + .159 = 3.501$—practically 3½ inches.

(307) J. G., Ont., asks: What is the horse-power of a vertical steel boiler 15" diameter, with 76-¾" tubes each 2' 6" long? *A.*—Data as to the fire-box is lacking. Probably with forced draft you could work it so as to get about 3 horse-power in a small boat engine. 2. For a yacht 30 feet long, 5 feet beam, would a two or three bladed propeller, diameter 18", be best? *A.*—For high speed we should prefer two blades.

(308) C. H. R., Copperville, N. H., writes: I send you a small piece of wood, can you tell me now the mixture is made with which the wood is coated? *A.*—The piece of wood in question appears to be coated with some form of asphaltum varnish. Try melting ¼ pound of Egyptian asphaltum, and then stirring in 2 oz. shellac and 1 quart of turpentine.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Patent Att'y, H. W. T. Jenner, Washington, D. C.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Edw. Sears, Wood Engraver, 169 William st., N.Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Korting Exhaust Steam Condenser. Send for descriptive catalogue K. A. Aller, 109 Liberty st., N.Y.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., NY

20,000 addresses of steam users and users of mach. in 10 States, $10. J.N.Mills Pub.Co.,30 Vesey st., N.Y.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 93 John st., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

Tack, Wire and Shoe Nail Machinery. Wm. A. Sweetser, Brockton, Mass.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Improved Labor-saving Upright Drills, 20-in. to 36-in., inclusive. Currier & Snyder, Worcester, Mass.

Veneer machines, with latest improvements, Farrel F'dy & Mach. Co., Ansonia, Ct. Send for circular.

Engine Lathes, Hand Lathes, and other fine tools, Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

Best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Governors, and Back-Pressure Valves. T. Kieley, 11 W. 13th st., N. Y. Send for description.

St. John Improved Self-adjusting Cylinder Packing, for marine and stationary engines and locomotives; applicable to water, air, oil and ammonia pumps. For durability and minimum of friction, it is unexcelled. Send for pamphlet. Address, Balance Valve and Piston Packing Co., room 58, 280 Broadway, New York.

Wanted—Numbers 1, 2 and 4 of volume IV., 1881; must be in excellent condition for binding, if soiled we cannot use them; for copies described as above we will pay 25c. each, and prefer to have the whole three if possible. Parties favoring us will kindly write name and address on wrapper. AM. MACHINIST Publishing Co., 96 Fulton street, N. Y.

Patent Binders for the AMERICAN MACHINIST, holding a complete volume (52 issues), simple, neat, durable. Price $1, prepaid, to any part of the United States by mail. To Canada or foreign countries the price will be 75c.; purchasers pay express charges and customs duties. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2, post-paid. Published by John Wiley & Sons, 15 Astor Place, New York.

MANUFACTURES

W. F. Wells will erect a foundry at Little Ferry, N. J.

E. J. Bennell will build an emery factory at Bainbridge, N. Y.

The Gould Mfg. Co. intend to build a foundry at Seneca Falls, N. Y.

Covington, Ky., and Salisbury, N. C., will build water-works.

Cuppett & Webb, of Portsmouth, Ohio, will erect a new saw-mill.

The Bridge Beach Mfg. Co., St. Louis, Mo., will build an iron foundry.

John E. Burton is building machine shop and foundry at Henley, N. J.

Knowlton & Kelley, machinists at Troy, N. Y., are building a new shop.

The Barnard & Leas Mfg. Co., Moline, Ill., will enlarge their foundry.

A furniture factory is to be built by A. G. Myers at Sutton, W. Va.

The Bath (Me.) Iron Works are to build an extension to their works.

The Standard Foundry Co., East St. Louis, will build a large foundry.

The Jarecki Mfg. Co., is to build a foundry which will be the largest in Erie, Pa.

R. C Snowden, Elizabeth, Pa., will build a metal shingle factory at McKeesport, Pa.

The National Wire Mattress Company will build a manufactory at New Britain, Conn.

The Mechanic's Mills, Fall River, Mass., propose to put in new boilers and another engine.

Bleam Brothers, Pomeroy, Iowa, are about to build an addition to their steam mill.

Ruffner Bros., Charleston, W. Va., will build a $100,000 hotel, also an engine and boiler room.

The new bridge across the Chicago (Ill.) river will be built by the Chicago Forge & Bolt Co.

Money is being subscribed in Newark, N. J., for the purpose of starting a co-operative brewery.

The L. C. Richards Hardware Co., Winsted, Conn., intend to build a new factory 150 feet long.

The Everett Mills, Lawrence, Mass., are putting in foundations for an addition to their picker house.

An ultramarine factory is to be built at Newark, N. J., by Helles & Merz, 55 Maiden Lane, N.Y. City.

It is expected that the Iowa Barb Wire Works, South Easton, Iowa, will be removed to Allentown, Pa.

The Union Iron Company, Selma, Ohio, will erect a new machine shop, also a pattern shop and foundry.

I. & F. Mentzer, Franktown, Pa., contemplate the remodeling of their mill and putting in the roller process.

Richard Walter will build a two-story brick factory, 42x100 feet, on 166th street, east of Railroad avenue, N. Y. City.

A new brick wire shop is to be erected for the National Mfg. Co., on School, corner of Union street, Worcester, Mass.

The New York Architectural Terra-Cotta Co. will rebuild their factory, recently destroyed by fire, at Long Island.

A new mill is to be built by the Hockanum Co., Rockville, Conn., on the site of the present mill, which is to be removed.

The Shipman Engine Co., Pearl and High streets, Boston, are increasing their facilities for manufacturing one horse-power engines.

Nathaniel E. Taft, North Oxford, Mass., intends to fill with machinery a mill in Oxford, and to manufacture fancy cassimeres therein.

A large skating rink and machine shop at Kennebunkport, Me., is to be utilized by the Wilson Mfg. Co. for making their patent patch and leak stopper.

B. S. Freeman & Co., Attleboro, R. I., will rebuild their factory recently destroyed by fire. The building was occupied by several manufacturing jewelers.

The Northwestern and the Wisconsin Malleable Iron Companies, Milwaukee, Wis., are enlarging their works by the addition of new buildings and machinery.

The Nair Linoleum Mfg. Co., with a capital of $300,000, has been organized, and has filed articles of incorporation in the Clerk's office of Hudson county, N. J. The company will at once erect several immense buildings in Harrison.

L. L. Whitney will build a new brick mill, with engine and boiler house, in Millbury, Mass. It has already been leased by the Stonemetz Printers' Machinery Co., of Erie, Pa., who expect to begin business in two months, and to employ 150 men.

The Marinette (Wis.) Iron Works Company are building an addition of 70x120 feet to their machine shop. They have also just completed a thoroughly fire-proof pattern warehouse of brick and stone with iron roof, 120x30, and are employing 175 men and working day and night.—*American Manufacturer.*

The business men of Ionia, Mich., held a meeting Tuesday and determined to boom the place as a manufacturing town. Committees were appointed to feel the popular pulse and find what inducements would be offered to manufacturers to locate there.—*Grand Rapids Telegram-Herald.*

The citizens of Maple Rapids, Mich., will help Eli Jones rebuild his mill, and are contributing liberally to that end. That is the "wild western style." In some older localities the people would content themselves with pitying Mr. Jones, and wondering what he would do to get started again.

Thomas D. West writes us from Lockport, N. Y: "I am here to start up and perfect processes for the production of aluminum, bronze, brass, silver, and silicon castings at the Cowles Electric Smelting and Aluminum Co.'s works. The industry is a new one for this country. The castings it is intended to make will weigh from one ounce up to guns which will rival Krupp's. The company has stock to the value of one million dollars, their plant is a fine one, and means will be used unsparingly to make the business a success. The time fixed for starting is the 18th of August."

A pamphlet on the Mitis process of producing wrought iron and steel castings, by W. F. Durfee, general Manager of the U. S. Mitis Co., 26 Broadway, N. Y., has recently been issued. It is made up of extracts from papers read before the American Institute of Mining Engineers, and the British Iron and Steel Institute; also reports of Charles E. Cowper and E. A. Cowper, late president of the Institution of Mechanical Engineers of London. The process and results are clearly explained without the trouble of reading at great length. The pamphlet will be mailed to those interested upon application.

The L. B. Flanders Machine Works (Pedrick & Ayer), of Philadelphia, write us: "We recently shipped to the Hope Iron Works, Atlanta, Ga., an equipment of portable boring machinery for reboring cylinders and Corliss valves in their present positions, and one of our "Gyp" engines for running the same. We are building a fine line of this portable boring machinery for same purpose for Warner & Hough Machine Co., St. Paul, Minn., together with "Gyp" engine, a wrist-pin machine, and one of our new cylinder boring machines for shop work. We are very busy indeed, having many orders on our books for special tools for railway repair shops. There has been for months past a growing demand for these portable tools.

"The Story of the Murphy Varnishes," is the name of a handsomely-printed and gilt-edged pamphlet with a "buried bronze" stiff cover lately issued by the Murphy Varnish Co., and for which we are indebted to A. B. Garner, 227 Broadway, N. Y., the company's resident manager in this city. The book tells in 24 pages what "Professor Deering" and his class of students learned about varnish-making in a day's visit to a railroad car shop and to the company's works at Newark, N. J. The narrative and asides, which we believe are from the pen of the well-known writer, W. A. Croffut, are cleverly told, while the more substantial portions, filled in by the practical men of the company's works, are as full of information as of general interest, to mechanics and others who have occasion to use or desire to be posted about varnishes.

Among the recent sales of the National Feed-Water Heater manufactured by the National Pipe Binding Co., at New Haven, Conn., are the following: 100-horse to Kankakee, Ill.; 100-horse to J M. Williams, Gibsonville, N. C.; 100-horse to Salem, Mass.; 200-horse to Morgan Envelope Works, Springfield, Mass.; 200-horse to P. & F. Corbin, New Britain, Conn.; 200-horse to Randolph & Clowes, Waterbury, Conn.; 150-horse to Poughkeepsie Electric Light Station; 100-horse to A. Clarkson, Fall River, Mass.; 30-horse to Brush Hill Iron Works, Philadelphia, Pa.; 100-horse to Scaborad Mfg. Co., Mobile, Ala.; 150-horse to Household Sewing Machine Co., Providence, R. I.; 100-horse to Glasgo Yarn Mills Co., Jewett City, Conn.; 150-horse to F. Crankso, Moosup, Conn.; 80-horse to Geo. A. Lowe, Salt Lake City, Utah; 300-horse to Atlantic City Electric Light Co., N. J.; 80-horse to Middletown Electric Light Co., Conn.; 60-horse to Bunnell & Co., Dayton, O.; 100-horse to G. F. Hall, New York; 200-horse to E. Miller & Co., Meriden, Conn.; 100-horse to A. B. Reik, Copenhagen, Denmark.

The Ottumwa Iron Works, Ottumwa, Iowa, write us: "At a meeting called July 23, at Ottumwa, Ia., an organization was perfected and officers elected, with a capital of $1,000,000, to build a railroad under the name of the Ottumwa and Northern, from this point north about sixteen miles to a connection in Mahaska county with the Iowa Central and the Chicago & Northwestern Railroad, and thence northerly, which will be used by these roads for an entrance into this city, though the former already runs trains over the C. R. I. & P., but desire an independent line. It is the expectation to begin operations at once, and, as these roads have signified their intention of making this city a point on their lines in the near future, it is probable that through trains will be running over both roads this fall. This line will open an extensive coal field in this county at present undeveloped, adding to our already cheap fuel, which is delivered for manufacturing purposes at fifty cents per ton at our mills, and will, in addition to the railroads now running here, give us direct communication over nearly all of the trunk lines of the West, among which are numbered the C. B. & Q., C. M. & St. P., Wabash, St. L. & P., C. R. I. & P., Iowa Central, Ottumwa & Kirkville, making, in connection with the C. & N. M., seven important lines; and, in view of these facilities, our cheap fuel and our water power (upon which extensive improvements are now being made), we can offer superior advantages to parties seeking a location."

The Watts-Campbell Co., Newark, N. J., are remarkably busy on orders for steam engines. They are delivering the sewage pumping engines for the city of Newark, although the buildings and foundation are not yet ready for their erection. These engines consist of two pairs, steam cylinders, 20"x 36"; water cylinders, 36"x36"; piston rods connecting to pumps through back heads. We noticed under construction a pair of tandem compound engines of 700 horse-power, for the Marshall Thread Co., East Newark; a pair tandem compound, 400 horse-power, for the Mechanics' Mills, Fall River, Mass.; one same size as above for Coe Brass Mfg. Co., Torrington, Conn.; one pair condensing engines, 800 horse-power, for the Clark Thread Co., of Newark; one pair, 400 horse-power, for Wm. Strange & Co.'s silk mill, Paterson, N. J.; one 150 horse-power for Paterson Electric Light Co.; one 250 horse-power for Sterne Bros., New York; one 250 horse-power for Newark City Silk Mills, to be used at Bethlehem, Pa.; one pair 100 horse-power for New York Life Insurance Co., to be used for electric lighting; one 150 horse-power for P. M. Wilson, New York; one 150 horse-power for —— Maxams, New York; one 100 horse-power for Fox Changeable Button Co., Astoria, N. Y.; one 50 horse-power for the New York *World*, to be placed in their Brooklyn building; one 200 horse-power for N. Y. Central Sleeping Car Co., Buffalo, N. Y.; one 200 horse-power for Decker Bros., New York; one 200 horse-power for Electrical Accumulator Co., Newark; one 60 horse-power for N. Y Architectural Terra-Cotta Co., L. I.; one 60 horse-power for Henry Grant, Philadelphia; one 60 horse-power for P. J. Collier, New York; one 50 horse-power for John Mehl & Co., Jersey City Heights one 60 horse-power for Hanley & Hoopes, New York, besides several others not noted. They have just constructed for one of their engines recently delivered a belt fly-wheel 26 feet diameter, 9½ feet face, turned crowning for four driving belts. We were told that this wheel was turned in 141 hours on their vertical pulley lathe, which is their own manufacture. We also noticed under a construction a 26-foot wheel with a 6½-foot face. Altogether it looks as if this company would be obliged to make considerable further additions to their works to avoid working so much overtime.

Machinists' Supplies and Iron.

NEW YORK, Aug. 5, 1886.

There is no noticeable change in the supply business or in manufacture.

Iron - Business is only transacted in moderate proportions in American Pig. The best brands are held firm at quoted prices, and offerings are small. Standard brands are quoted at: No. 1 X Foundry, $18 to $18.50; No. 2, $17 to $17.50; Grey Forge is held at $16 to $16.50.

Scotch Pig—The demand for Scotch brands continues light, and prices remain unchanged. We quote Coltness, $20; Glengarnock, $19; Gartsherrie, $19.50; Summerlee, $19.50; Eglinton $17.50 to $18; Langloan, $19.50; Dalmellington, $18.50.

Lead—4.75c.

Antiimony—Hallett's, 8c.; Cookson's, 9c.

Copper—10c.

Spelter—Refined, 5¾c. to 6c.

Tin—Banca, 22½c.; Straits and Malacca, 21.60c.

✲WANTED✲

"Situation and Help" Advertisements only inserted under this head. Rate, 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—Situation as planer hand; 20 years' experience. Address P. S., AM. MACHINIST.

Wanted—Situation as journeyman moulder on general jobbing work; best of references. Address E. D. G., AM. MACHINIST.

Wanted—A mechanical engineer and draftsman, experienced in designing and construction. Address, with reference, Williamson Bros., York and Richmond sts., Philadelphia, Pa.

An experienced draftsman on steam engines and general machinery would like to change position. Y. X., AM. MACHINIST.

A thorough machinist and draftsman desires to take position in machine works where a right-hand man is required. B., AM. MACHINIST.

Wanted—By practical mechanic, position as foreman; 15 years experience as manager; strictly temperate and industrious. Address O. M., AM. MACH.

Traveling salesmen handling engineers' and mill supplies, can make desirable arrangements to sell "Eureka" packing. Special pocket-book of samples furnished. Hine & Robertson, 12 Cortlandt st., N.Y.

Draftsman and inventor of responsible capability is open for engagement; thorough experience on steam engines; successful as inventor. A. F. Fogelquist, 367 Broad street, Newark, N. J.

Wanted—Situation as foreman of machine shop, by an experienced man; had large experience in building automatic engines, etc.; age, 32; first-class references. Address "Automatic," AM. MACHINIST.

Wanted—Foreman in a small hardware factory; one who thoroughly understands the manufacturing of small tools. Address, stating age, experience and wages expected, Hardware, AM. MACHINIST.

Wanted—A good opening is offered a smart young Polytechnic graduate, with $2,000 to $5,000, for partnership with old engineer in engineering office and manufacturing combined in vicinity of N. Y. Address Practice, AM. MACHINIST.

Wanted—Traveling salesmen selling to steam users, machinery and mill supply houses and the hardware trade, to write for my terms and commission on some fast-selling articles. Address J. L. K., AM. MACHINIST.

Wanted—Situation as foreman of boiler shop; understand marine, loco., stationary and furnace work; know how to work men and tools up to their full capacity; can make drawings and estimates; first-class references as to ability in above position. Address Jay, AM. MACHINIST.

Wanted—Situation as superintendent or manager by a practical machinist, with several years' experience as foreman in the manufacture of gas, kerosene, and electrical supplies; competent to make designs and estimates, and thoroughly posted in the use of all modern machinery for working metal. Address J. X. R., AM. MACHINIST.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent Boiler Compound has been used 40 years and still the best. Crescent Mfg. Co., Cleveland, Ohio.

The Cyclone Steam Flue Cleaner is king, and has no rival. Crescent Mfg. Co., Cleveland, Ohio.

Steel stamps, stencils, burning brands, and brass checks. T. M. Parker, Hartford, Conn.

Light mach'y of all kinds built at short notice. Edmund Mills, 8 Dey st., Jersey City Heights, N. J.

For Sale—A 7' swing face-plate lathe; low price. J. A. Stowell, Leominster, Mass.

Send for estimates of high-speed compound enginss for stationary and marine service. Crist Engine Works, 140 Baxter street, N. Y.

John Lamberty, mfr. telegraph and electrical instruments, experimental machs, models; fine gear cutting a specialty. 35 S. 5th st., Br'kl'n, E.D., N.Y.

Special tools and machines for mfg. designed and built to order; mechanical and patent Office drawings. Weston & Smith, Syracuse, N. Y.

To Rent—Desirable space, 8x10, in light, well-fitted office; heart of machinery trade; $12 per month. Hine & Robertson, 12 Cortlandt st., N. Y.

✢ MISCELLANEOUS WANTS. ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

For Sale—A well established foundry and machine shop, including lots, buildings, machinery, patterns, and stock on hand, situated in Logan, Hocking Co., Ohio; will sell on easy and satisfactory terms; reason for selling—old age and ill health. Apply to R. Belt, Logan, Ohio.

Wanted—A second-hand engine lathe, of Bridgeport Tool Co.'s or equally good make, 8" or 10" swing, 5' or 6' bed, hollow spindle, with 6" universal chuck; want above in good condition, and for which we will pay a reasonable price. The John T. Noye Mfg. Co., Buffalo, N. Y.

M. Martin, manufacturer. P. O. Box 285, New Brunswick, N. J., will contract for the manufacture of articles in brass and other metals (stamped or turned), and dies and tools for making same; also patent novelties, electrical inventions, special machinery castings, etc.; estimates cheerfully given.

Alfred Dolge (Felt. Dept.), Dolgeville, N. Y., writes to T. R. Almond, 83 and 85 Washington st., Brookiyn, N. Y. "Your Almond Couplings are doing splendid work. I have used two for months, to the satisfaction of every one in my mills. Am putting, up the third one now, and certainly give them the preference over beveled gears."

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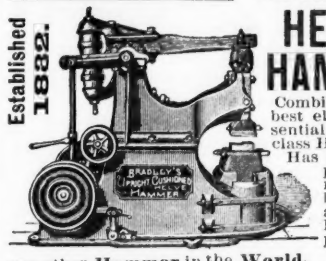

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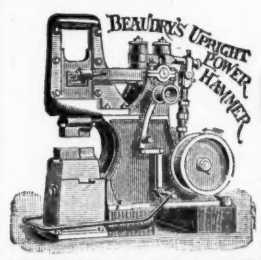

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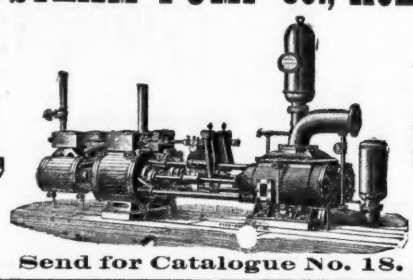

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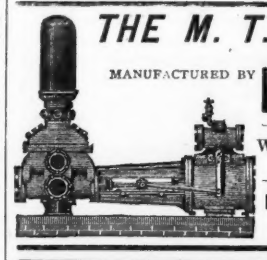

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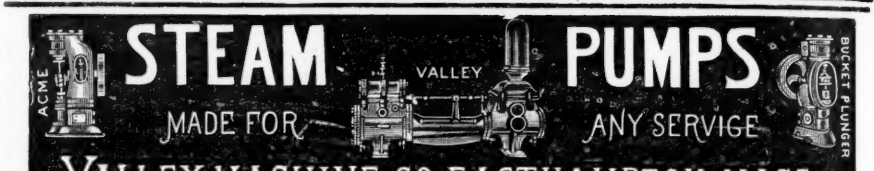

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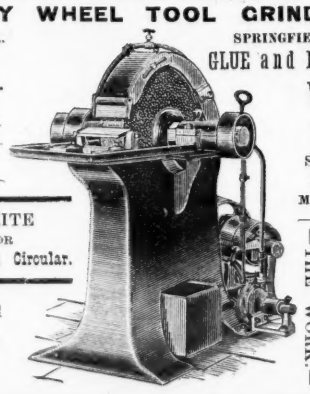

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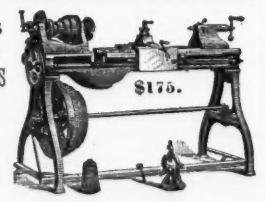

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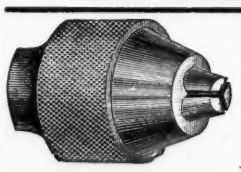

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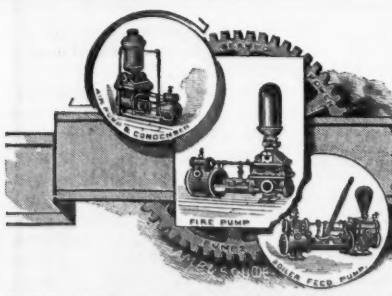

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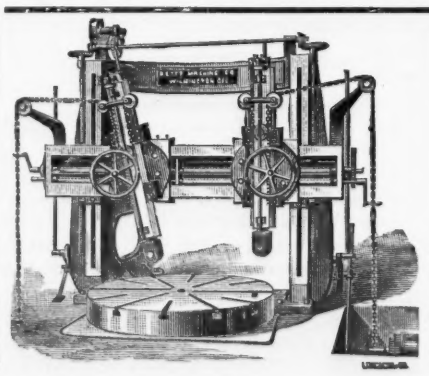

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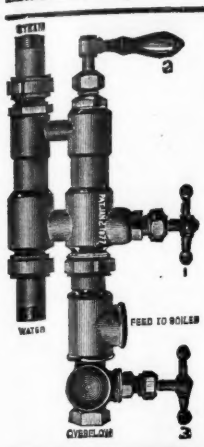

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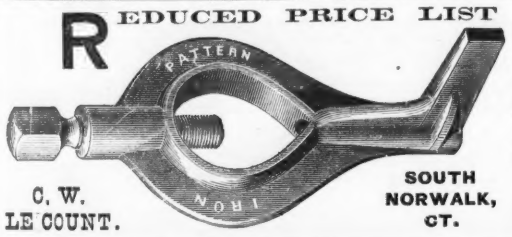

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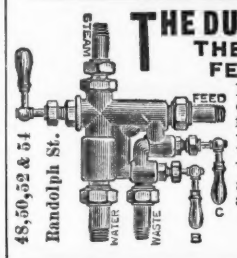

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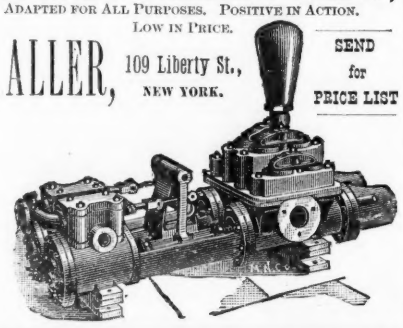

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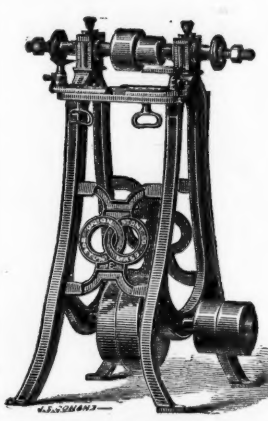

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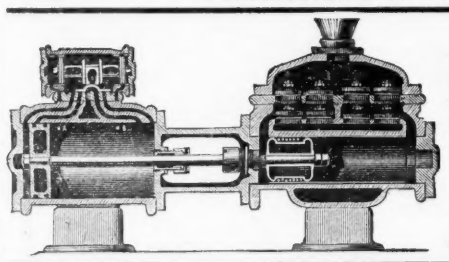

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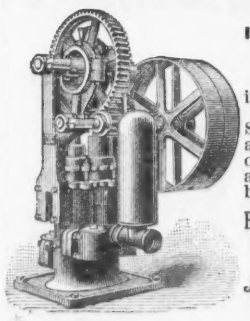

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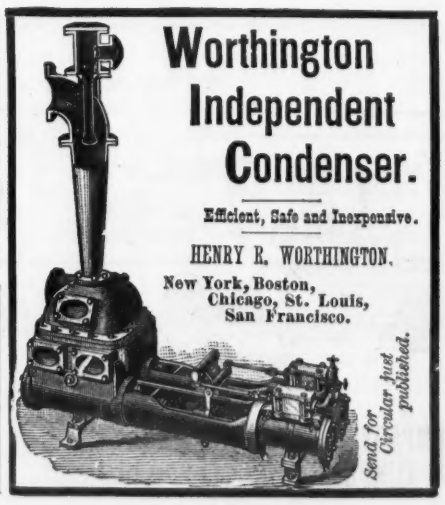

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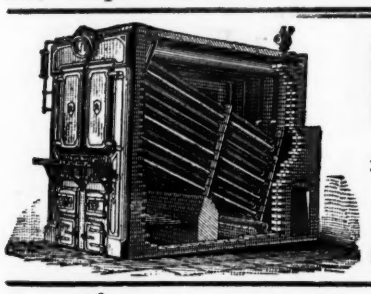

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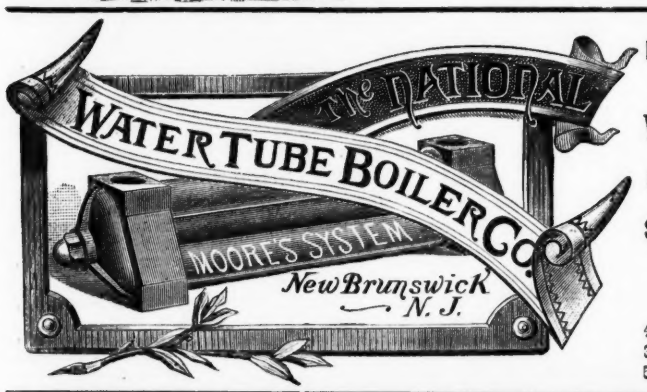

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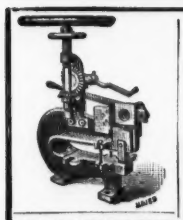
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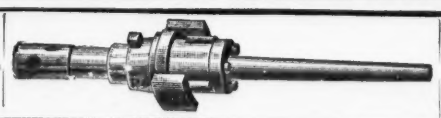
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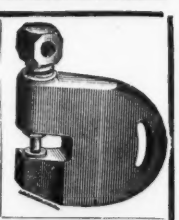
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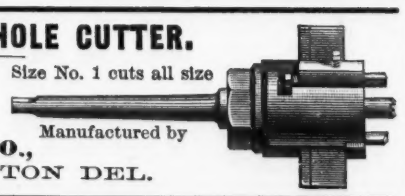
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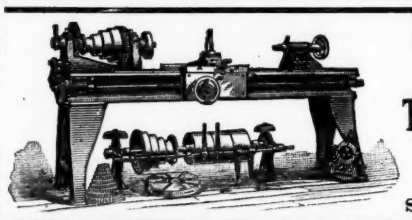
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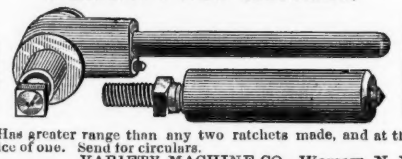
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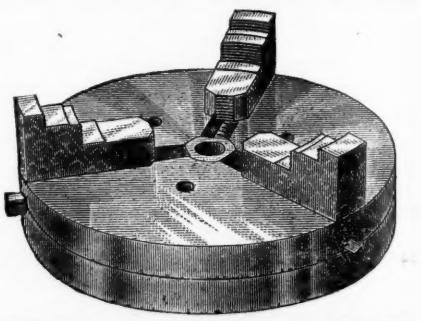
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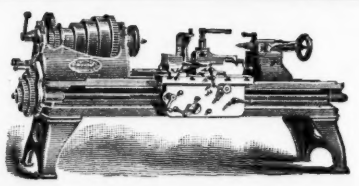
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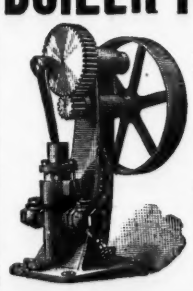
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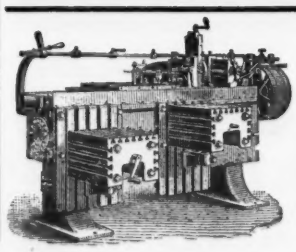
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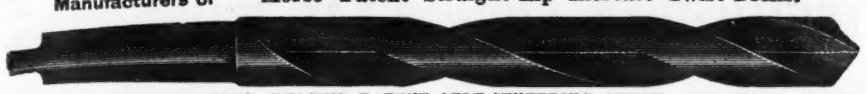

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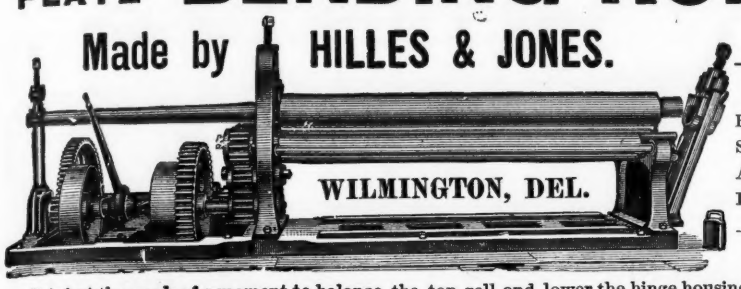

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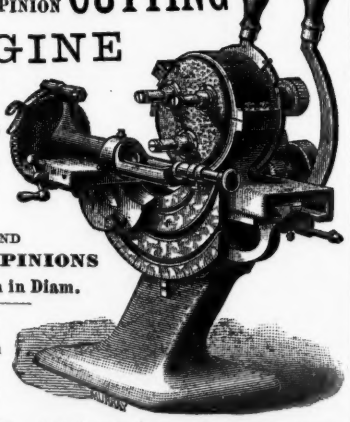

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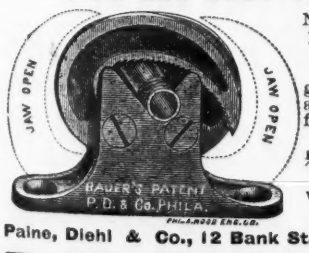

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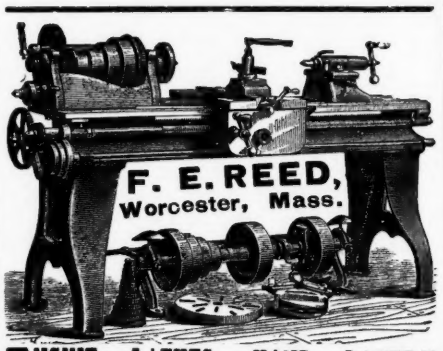

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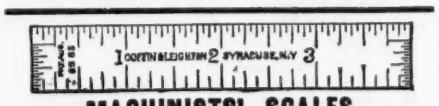

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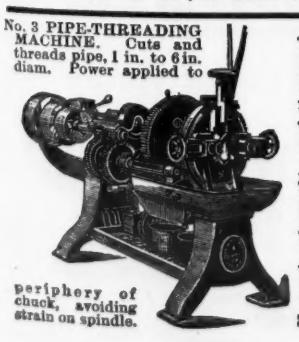

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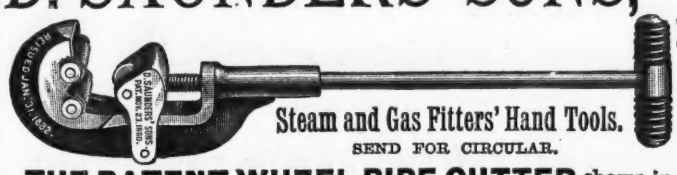

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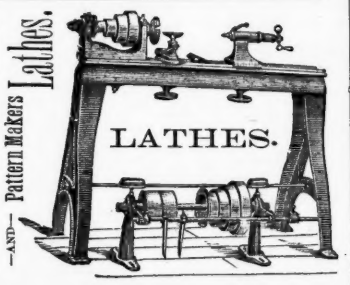

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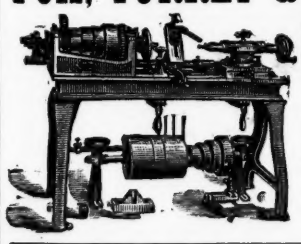

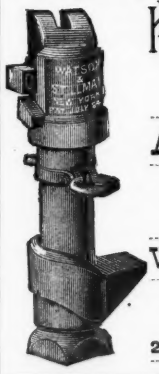

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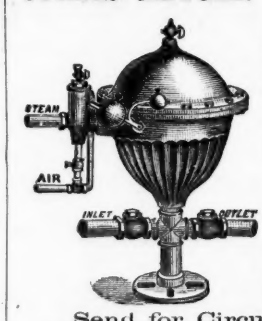

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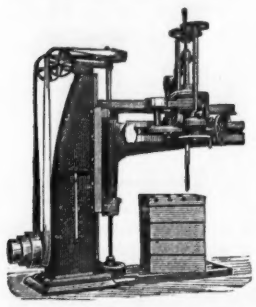

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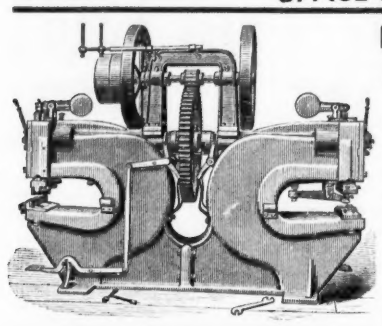

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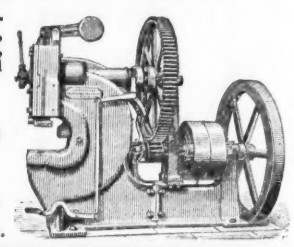

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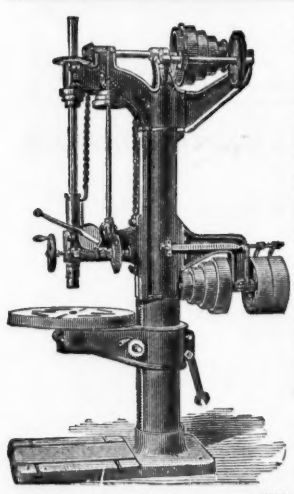

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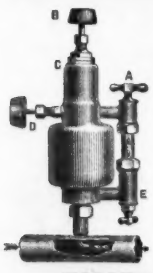

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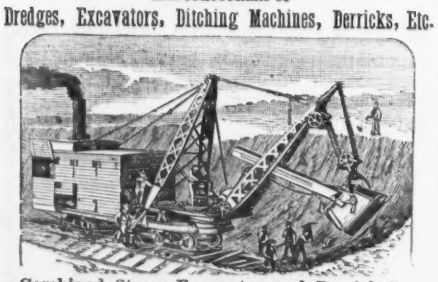

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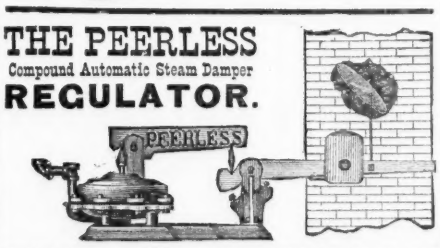

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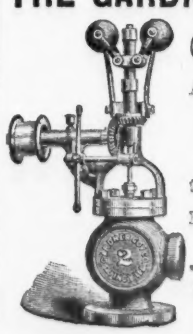

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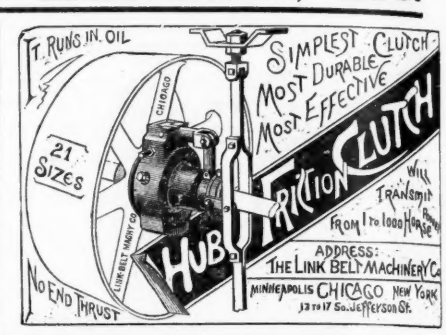

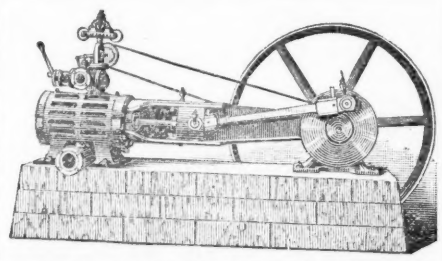

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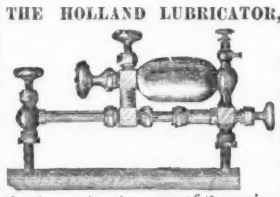

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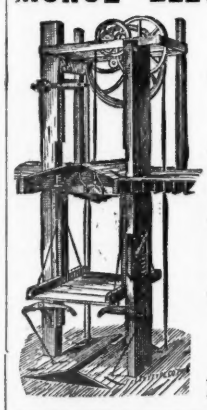

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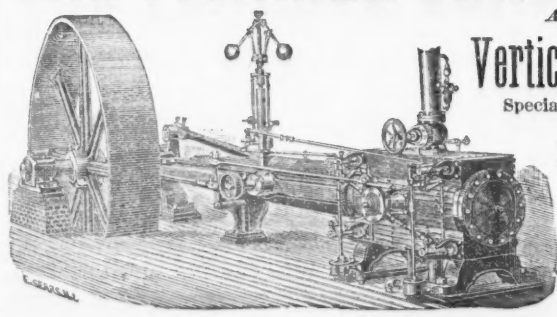

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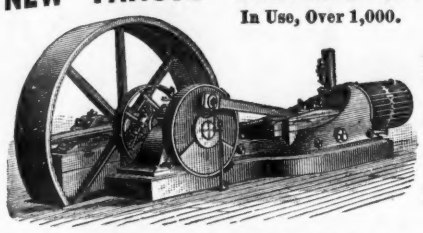

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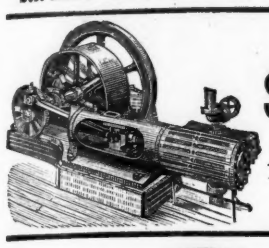

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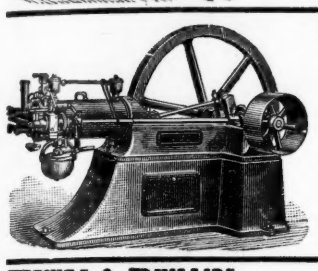

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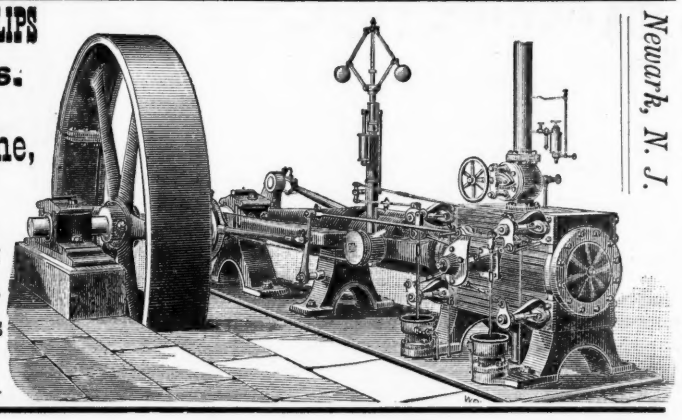

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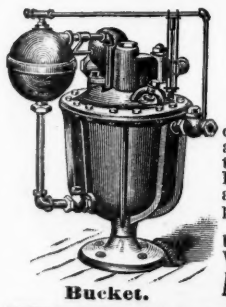

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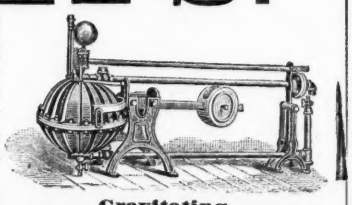

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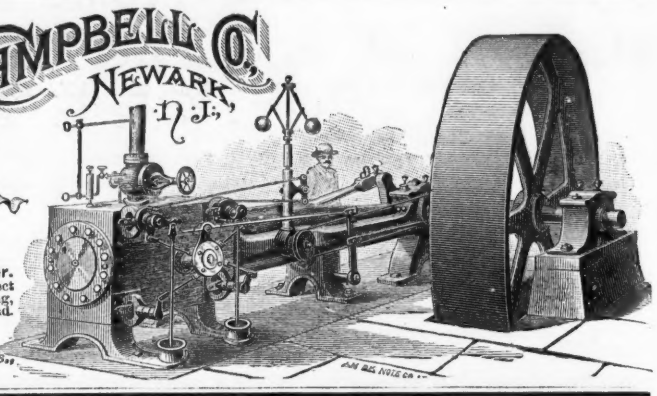

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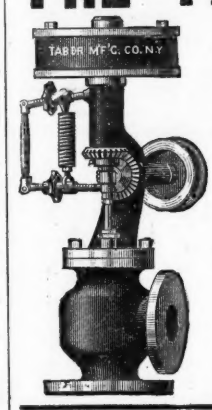

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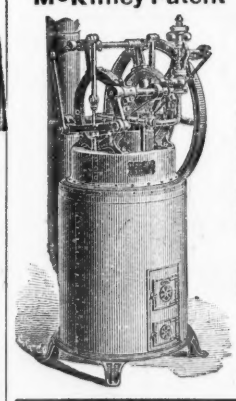

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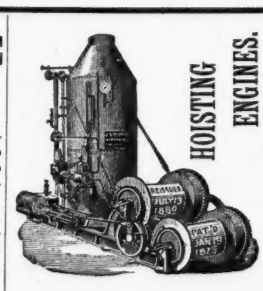

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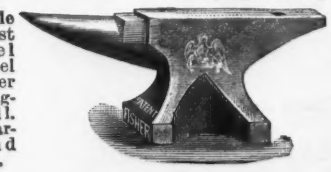

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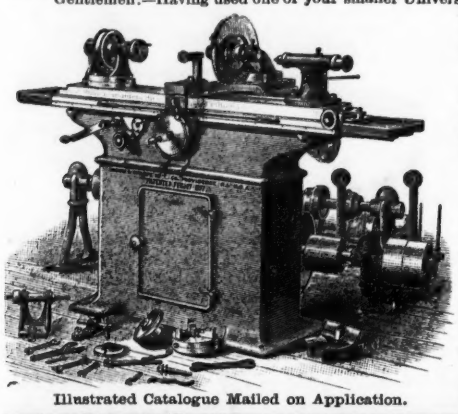

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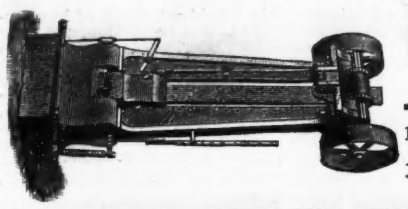

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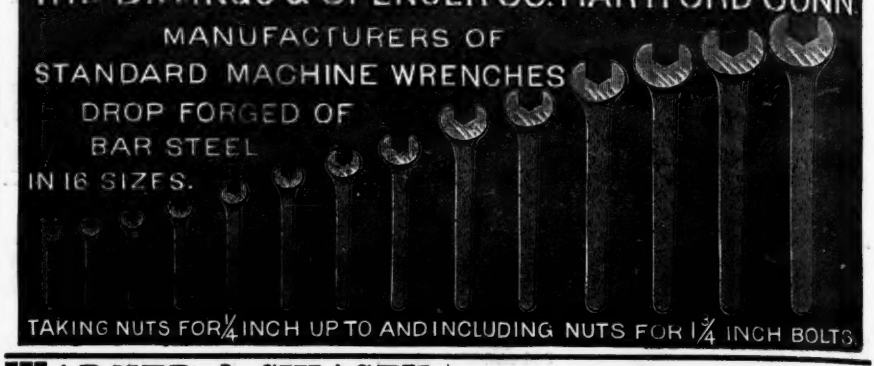

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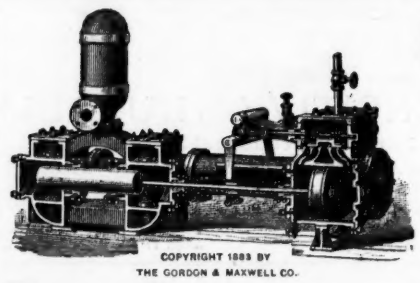

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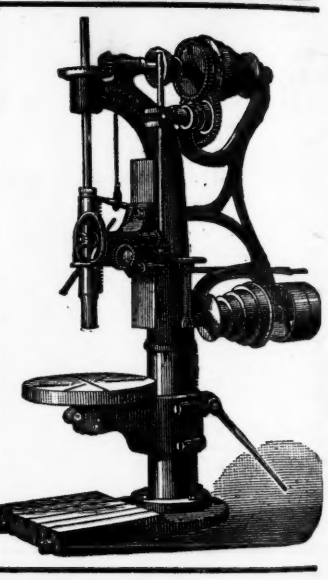

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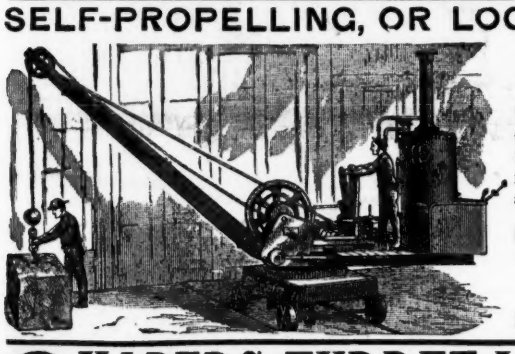

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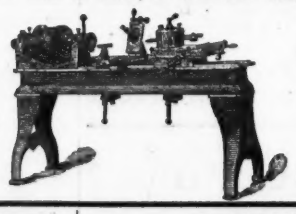

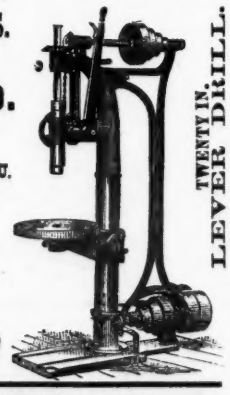

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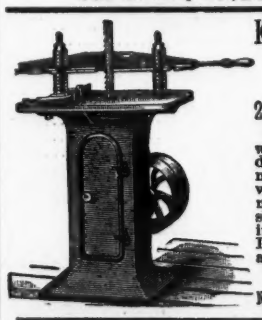

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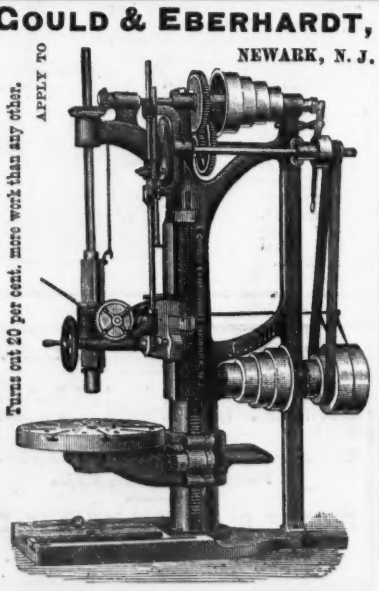

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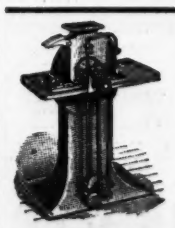

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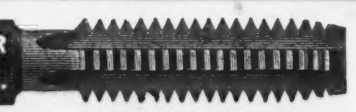

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